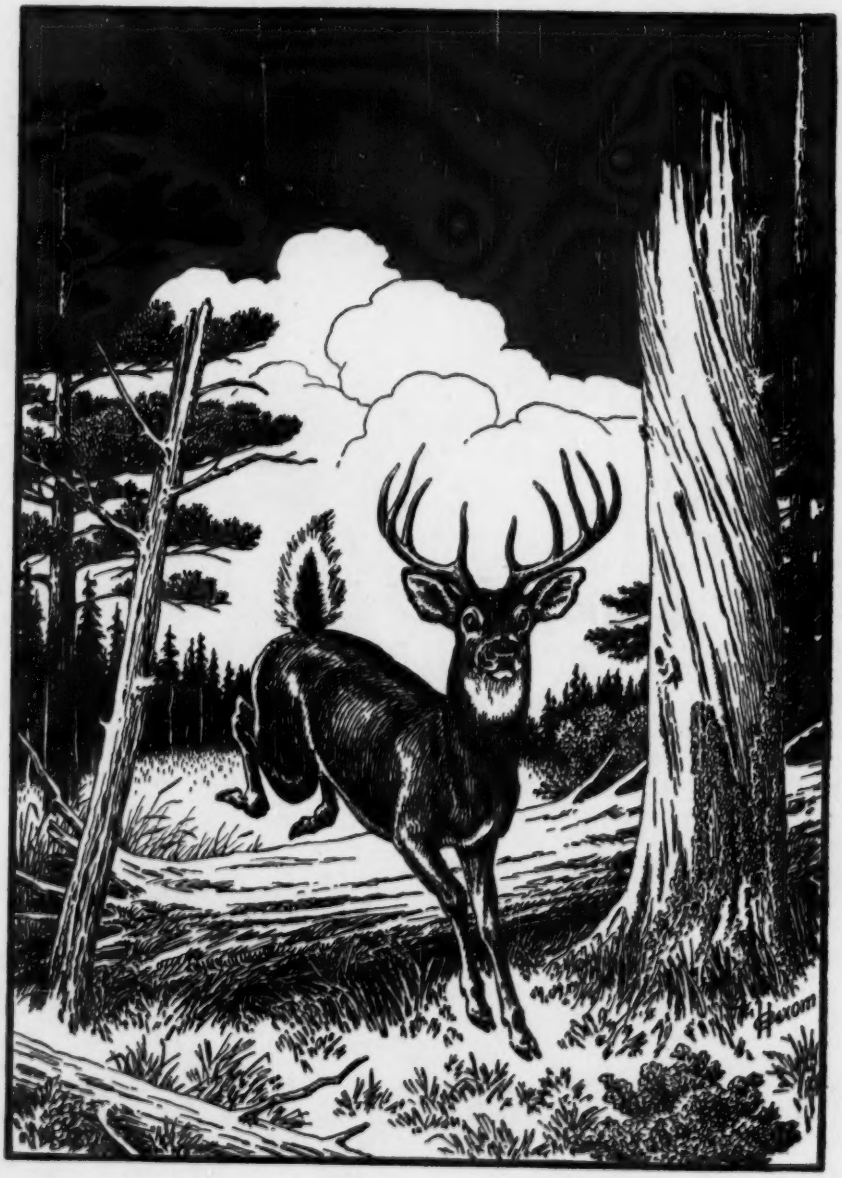
Nature Magazine



OCTOBER
1955

VOLUME 48
NUMBER 8

50 Cents

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Nature *Magazine*

OCTOBER, 1955 VOL. 48, NO. 8

Published by the **AMERICAN NATURE ASSOCIATION** to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America

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Nature Magazine past and present, is indexed in The Reader's Guide in your public library.

Landscaping Your Own Home

By Alice L. Dustan. New York. 1955. Macmillan. 248 pages. Illustrated. $3.95.

In this practical book the author reflects the do-it-yourself trend by giving advice and information on being one's own landscape designer. She writes against a background of long experience in this field, both as landscaper and teacher. Starting with an inventory of what the owner has to work with, the text develops the basic plan into the finished planting. This is a valuable and useful book.

The Botany of Cook's Voyages

By Elmer Drew Merrill. Waltham, Mass. 1955. Chronica Botanica Company. 384 pages, plus plates. $4.75. This interesting book with, perhaps, its greatest appeal to botanists, deals with the unexpected significance of Cook's voyages, and their botanical discoveries, to anthropolgy, biogeography and history. Through a Guggenheim grant, the author, Arnold Professor of Botany, Emeritus, Harvard University, was able to carry on research in England and on the continent, and thus bring about this scholarly and important work.

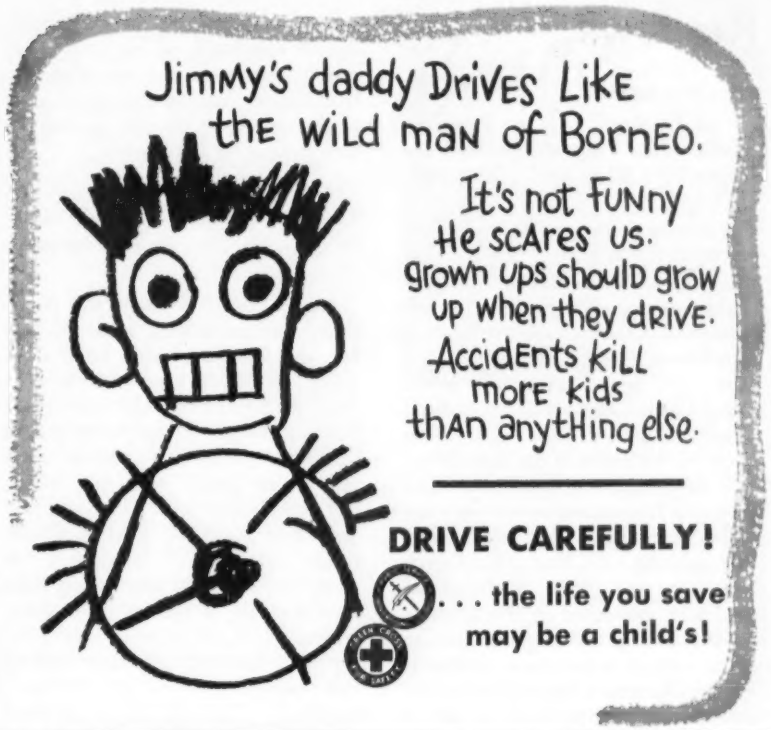
This Is the Beagle

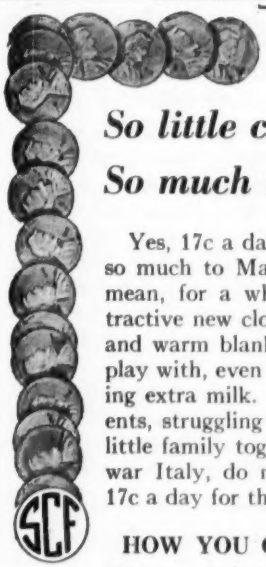
By George D. Whitney. Orange, Conn. 1955. Practical Science Publishing Co. 252 pages. Illustrated. $3.95.

Always a popular dog, the beagle appears to be at a special height of popularity at this time. Its field importance has been added to by many who find this dog a fine pet and house dog. Whatever one's interest in this breed, this book would appear to be essential to any beagle-owner's library. It considers the dog from the time of its selection as a puppy to its relationship to hares, rabbits and conservation. The text covers care, breeding, showing, judging and so forth.

Carleton Arboretum

The Carleton College Natural History Club, under the direction of Dr. Harvey Stork, professor of botany, is reshaping the college's decentralized Nature museum in the 360-acre arboretum adjoining the college campus. This arboretum is located on Route 19, just inside the city limits of Northfield, Minnesota, and is notably worthy of a visit.





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Reviews

The Caves Beyond

By Joe Lawrence, Jr., and Roger W. Brucker. New York. 1955. Funk and Wagnalls. 283 pages. Illustrated. $4.75.

It was in February, 1954, that the National Speleological Society sent the largest, best-equipped and most highly organized expedition in the history of America cave exploration into Crystal Cave, Kentucky. These were unknown caverns near where Floyd Collins met his death in Sand Cave a quarter-century ago. This book by the leader of the expedition, Mr. Lawrence, and one of its members, is a fascinating story, not only of cave exploration but of organization to explore. The speleologists had little to go by. Nothing had ever been attempted in this country on this scale, and explorations in caves abroad were quite different. This really was a case of mountain-climbing in reverse, and to take a minimum of thirty people underground for a week, explore an intricate system of caves, feed and keep the explorers healthy, and get them out alive was a pioneering undertaking. With our claustrophobia increasing with age, we would prefer to *read* about this expedition, but we will heartily commend this as a fascinating report. As Charles E. Mohr, Past President of the National Speleological Society, says in his foreword:

"It is impossible to read these pages without recognizing the insatiable drive that spurs man onward, or realizing how frustrating it is to turn back when you can see with the explorer's eyes that there are caves beyond. But never completely solved logistics problems, the growing fatigue that becomes overwhelming—that invisible but insurmountable endurance barrier—and the paralyzing uncertainty as to where you are in the uncharted maze, combine to make the caves beyond unconquerable."

The People of the Sea

By David Thomson. New York. 1955. The John Day Company. 214 pages. $3.50.

Seals and sealing, and the relationship of man to these animals on the Irish and Scottish coasts and coastal islands, are the subject of legend and superstition. The author of this book has lived with the people among whom these legends prevail, and in this book he recreates these people, with seals the central theme. It makes fascinating reading, thanks to the veracity of the dialog and the background for his stories.

The Hunting Wasp

By John Crompton. Boston, 1955. Houghton Mifflin Company. 240 pages. $3.00.

Wasps would not win any popularity contest among most people, but the author of this book does much to dispel ideas people may have with respect to the solitary or hunting wasp. As he points out at the outset, he is not dealing, until late in his book, with the "black and yellow thief who filches our jam and marmalade at mealtimes and spoils our fruit." Instead, he is concerned with the interesting lives of a number of species of hunting wasps. The reader will inevitably become a wasp-watcher after reading this book.

The Underwater Naturalist

By Pierre de Latil. Translated from the French by Edward Fitzgerald. Boston, 1955. Houghton Mifflin Company. 275 pages. Illustrated. $3.50.

From the time when, at ten, he found profit in harvesting shrimp from the shores of the Mediterranean, the author of this book has loved the sea and what is beneath its surface. He has studied about everything written on the life in Mediterranean waters, and then has gone below to observe that life as it is lived by the sea's creatures. This book is, then, interesting and informative, both for the person interested casually in marine life and the person with a scientific or even economic interest.

A Child's Book of Wild Birds

By Alexander Seidel. Text by Dean Amadon. New York. 1955. Maxton Publishers, Inc. 32 pages. Illustrated in color and black and white. $.59.

This attractive little bird book has a title that is perhaps more inclusive than is warranted by its contents. The staff artist at the American Museum of Natural History has chosen to paint bird of paradise, the ostrich, kiwi, cassowary, king penguin, wandering albatross, gannet, brown pelican, snowy egret, shoebill, white and adjutant storks, American flamingo, California condor, peregrine falcon, two pheasants, secretary bird, crowned crane, fairy tern, puffin, American avocet, killdeer, crowned pigeon, scarlet macaw, road runner, barn owl, quetzal, toucan, kookaburra, great hornbill and lyrebird. This is a quite interesting but certainly catholic selection, ornithologically and geographically. It is not quite clear what age group is sought, but the text is not levelled at the younger level, excellent though it is. This book is one in a series of children's books on Nature, each retailing at the modest price indicated above.

An Introduction to Nature

By John Kieran. New York. 1955. Hanover House. 223 pages. Bird illustrations by Don Eckelberry; wild flowers by Tabea Hofmann; trees by Michael H. Bevans. All illustration in color. $6.00.

The three parts that make up this book have earlier appeared separately as introductions by the author to birds, wild flowers and trees. Putting these together is an excellent idea. The text is, of course, friendly, a sort of informal ramble afield with John Kieran. This is a large book and not suited for carrying afield but for pleasurable reading and reference at home.

Fruit of the Earth

By F. W. Nordhoff. New York. 1955 Vantage Press. 159 pages. $3.00.

A lifelong lover of Nature and the outdoors, this author has for some time been contributing little items to two California newspapers, the Santa Ynez *Valley News* and the Santa Barbara *News-Press*. Most of the brief notes of widely varied character —they range all the way from the cost of operating an automobile to crows and ravens—are reprinted in this interesting little book, which can be picked up at any time for a little browzing.

The Story of Mosses, Ferns and Mushrooms

By Dorothy Sterling. New York. 1955. Doubleday and Co. 159 pages. Photographs by Myron Ebrenberg. $2.75.

This is an introduction to the flowerless plants, a happy collaboration by author and photographer. It is a non-technical approach, intelligible and useful to the younger naturalist and to the absolute layman among adults. The book would have benefited by a brief bibliography indicating books in which the introduced reader could follow up the quite elementary information provided in this text.

Key to Wild Flowers, Ferns, Trees and Shrubs of Northern California

By Vesta Holt. Palo Alto, California. 1955. The National Press. 182 pages. $3.00.

In this loose-leaf field book the author, who is Professor of Biology at Chico State College, provides a good key and field guide to the region roughly from the Sutter Buttes north to the Oregon line and from the inner coast ranges east to the Nevada line. In order to use the keys it is necessary to know the family to which a flower belongs. The key is written for the layman and to aid him in knowing and enjoying wild flowers. Any errors due to simplification or for other reasons may be called to the attention of the author because completeness in a key of this sort depends upon its use.

Briefly Noted

Radioisotopes in Biology and Agriculture. By C. L. Comar. New York. 1955. McGraw-Hill Book Co. 481 pages. Illustrated. $9.00. An important textbook dealing with the place of radioisotopes in the fields indicated in the title and the techniques involved in their use.

Ancient Education. By William A. Smith. New York. 1955. Philosophical Library. 308 pages. $3.75. The author traces the cultural and educational development of the early Mesopotamians, Egyptians, Chinese, Greeks, Indians, Romans and Hebrews.

Eddie and His Big Deals. By Carolyn Haywood. New York. 1955. William Morrow and Company. 190 pages. Illustrated by the author. $2.95. Another of the "Little Eddie" stories for the younger reader.

Vulcan. By Robert M. McClung. New York. 1955. William Morrow and Company. 64 pages. Illustrated by Lloyd Sandford. $2.00. A story of a bald eagle for the younger reader.

Highway to the North. By Frank Illingworth. New York. 1955. Philosophical Library. 293 pages. Illustrated. $7.50. A story of journeying in the North and along the Alaska Highway.

Come Walk with Me. By Merrill A Maynard. Boston. 1955. Christopher Publishing House. 48 pages. $2.00. Collected poems of the blind Massachusetts poet and founder of the Braille Poets' Guild.

Proverbs for Pleasure. Edited by H. Pullar-Strecker. New York. 1955. Philosophical Library. 202 pages. $6.00. Two thousand proverbs from England, America and many other countries arranged according to meaning. An interesting book.

The Chicken and the Egg. By William H. Wilson and Arthur J. Burks. New York. 1955. Coward-McCann. 242 pages. $3.75. The egg, past and present, not to mention the hen that lays it.

Wood Handbook. Washington 25, D.C. 1955. U.S. Government Printing Office. 528 pages. Illustrated. $2.00. Basic information on wood as a material of construction, with data for its use in design and specification, prepared by the Forest Products Laboratory of the U.S. Forest Service.

General Principles of Geology. By J. F. Kirkaldy. New York. 1955. Philosophical Library. 327 pages. $6.00. A geology text intended as a general introduction to the subject and a starting point for more specialized work.

New Editions

Where to Find Birds in Minnesota. By Kenneth D. Morrison. W. J. Breckenridge and Josephine Daneman Herz. St. Paul 2, Minn. 1955. The Itasca Press. 157 pages. $2.00. This excellent guide to 78 birding areas, parks and sanctuaries has been revised and enlarged from the original edition first published in 1950.

Field Book of American Wild Flowers. By F. Schuyler Mathews; revised and edited by Norman Taylor. New York. 1955. G. P. Putnam's Sons. 601 pages. Illustrated in color and black and white. $5.00. This has become almost a classic field guide and one of the key books in the Putnam series. Its revision was needed.

Knowing Your Trees. By C. H. Collingwood and Warren D. Brush. Washington, D.C. 1955. American Forestry Association. 328 pages. Illustrated. $6.00. This is a new and enlarged edition of this excellent tree guide. The text is popular and the illustrations show the tree, its bark, leaves, fruit and distribution.

The Home Gardening Encyclopedia. New York. 1955. Philosophical Library. 368 pages. Illustrated. $6.00. This comprehensive book is British in origin but reasonable useful in the United States. The new edition contains 31 charts, 32 pages of photographs and five pages in color.

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Poetry Contest

Three prizes of $100, $50 and $20 are announced in an America Beautiful Poetry Contest by the National Life Conservation Society. Only original poems, one to a contestant and not more than 24 lines in length, may be submitted prior to the closing date of March 1, 1956. Poems will not be returned and a fictitious name should be signed to each poem, the correct name and address of the poet being in a sealed envelope attached to the entry. The object of the contest is to focus attention on our National Parks and unspoiled America, and to arouse appreciation of these outstanding areas. Poems should be sent to Mrs. Charles Cyrus Marshall, President, National Life Conservation Society, 2239 Tiebout Avenue, New York 57, N.Y.

Forestry Handbook

More than one hundred specialists in forestry, general resources conservation, wildlife management, soil conservation, range management, and lumber and paper industries have contributed to the *Forestry Handbook* prepared under the direction of the Society of American Foresters and published by the Ronald Press. This volume has been eight years in preparation and comprises 1212 pages. The list price is $15.00, but special prices are available to colleges when the book is for classroom use.

Wildlife Conference

"Pulling Together for Conservation" is the theme announced by the Wildlife Management Institute for the 21st North American Wildlife Conference, which will be held in New Orleans next March 5, 6, and 7, with headquarters at the Jung Hotel. As usual the general sessions will cover a broad picture of natural resource conservation, while the technical sessions will give specialists an opportunity to present the results of their findings in field work. There will be one session devoted to conservation education. Anyone interested in the conservation of natural resources is invited to attend the sessions of the conference.

Tree Farm System

Nearly two million acres were added to the American Tree Farm System between January and July of 1955, according to James C. McClellan, chief forester for American Forest Products Industries, national sponsor of the certified Tree Farm program. Through it forest management is now said to apply to 35,396,564 acres of taxpaying timberlands. In some States the Tree Farm acreage runs more than thirty percent of the commercial forest area in private ownership. Texas is the leading State in tree farming, with Arkansas second and Oregon third.

Watershed Congress

December 5 and 6 are the dates for the Second National Watershed Congress, which will convene again this year at the Statler Hotel in Washington, D.C. So successful was the first congress, held in 1954, that even greater results are expected from its successor. This Congress is an outgrowth of the law passed by the 83rd Congress providing for federal cooperation with State and local governments in planning and carrying out works of improvement for soil and water conservation on a watershed basis.

"Wilderness Day"

That is the title of a new motion picture that builds up an understanding and appreciation of the famous wilderness canoe country along the international border between Minnesota and Ontario, Canada. The film has been done by Dale Sanders and is made possible by funds provided by the Hill Foundation of St. Paul. The motion picture is in sound and color. Full details with respect to it and its availability may be secured from the Minnesota Foundation, 305 Wilder Building, St. Paul 2, Minnesota.

Mettler's Woods Saved

Preservation of Mettler's Woods, sixty-five acres of primeval forest in East Millstone, New Jersey, as a permanent shrine and center for woodland research has been assured. This was made certain by announcement from Maurice A. Hutchinson, president of the United Brotherhood of Carpenters and Joiners of America, that that organization had made a grant of $75,00 to that end. Thus, thanks to more than 2000 separate gifts, the land may now be purchased and remain inviolate for future study purposes.

"Forest Ranger"

This the title of a new series of half-hour television shows, the first three of which have been completed by Emerson Films, Inc., 301 East Erie St., Chicago 11, Illinois. These films will combine adventure, conservation and woodmanship, and they are being produced by Reinald Werrenrath, Jr., who is also producer of "Ding Dong School" and "Zoo Parade."

Constellation Cards

Latest publication of Naturegraph Company, Route 1, Box 190A, San Martin, California, is a set of cards, each card in the group of 39 showing a constellation. With this set and a good flashlight one can track down the stars. A set of these constellation cards sells for fifty cents.

Bulletins

"Forests of California" is a 147-page, paper-bound book, with popular text and many pictures, brought out as a part of the State's conservation program. Copies are available for sixty cents, plus State sales tax, from State Printing Plant, Documents Division, 7th and Richards, Sacramento 14, California.

"Hamster Guide" is a revised and rewritten discussion of the care and breeding of these little animals. One dollar from All-Pets Books, Inc., P.O. Box 151, Fond du Lac, Wisconsin.

"Fishes of Yosemite" by Willis A. Evans and Orthello L. Wallis is a 31-page, illustrated booklet directed to anglers who seek to land the native and introduced fishes in the Park. It is published as Vol. 23, No. 1 of *Yosemite Nature Notes*, monthly publication of the Yosemite Naturalist Division and Yosemite Natural History Association. Annual subscription $1.50.

"Operation Moon" by R. Will Burnett is a 48-page, illustrated booklet presenting the story of space travel in simplified scientific terms. Fifty cents from Science Research Associates, 57 West Grand Avenue, Chicago 10, Illinois.

"How to Collect Shells" is a 75-page booklet that comprises a symposium on the subject indicated by the title. It is available for one dollar from the American Malacological Union, Buffalo Museum of Science, Humboldt Parkway, Buffalo 11, New York.

"Bird Houses, Baths and Feeding Shelters" by Edmund J. Sawyer has now been brought out in a fifth edition by Cranbrook Institute of Science, Bloomfield Hills, Michigan. This useful and practical publication is available for fifty cents.

Contents noted

BY THE EDITOR

CONSERVATION FARED REASONABLE WELL in the recent session of the 84th Congress. On the positive side there was the passage of a law that will check bogus mining claims in National Forests, and on other public lands. Under the old law serious abuses were possible. Congress also thawed out the $13,500,000 fund built up from the earmarked tax on arms and ammunition. This will be spent, during the next five years, for acquisition and development of wildlife lands, for wildlife research and management. On the positive side, from the point of view of conservationists, was the shelving, for the moment, of the Upper Colorado project, which included the building of Echo Park Dam in Dinosaur National Monument. Increased appropriations were given the Fish and Wildlife Service, U.S. Forest Service and the Soil Conservation Service, and the National Park Service received a 40 percent increase, mainly for needed road construction. Congress failed to act on a bill extending and improving the Water Pollution Control Act, although the Senate passed the bill. Congress "sold down the river" the Wichita Mountains National Wildlife Refuge by approving the Army plan to take over much of that Refuge for artillery purposes. There is still hope that the Secretary of the Interior will block transfer of these lands. The Forest Service was given $700,000 to improve and care for the sanitation of public camp grounds in National Forests, but legislation really to meet the need of implementing the recreational use of these areas failed. The bill that would give the wildlife refuge system real protection did not get a hearing, but one is promised at the next session.

"SO VITAL IS THIS QUESTION OF CONSERVATION," declared Theodore Roosevelt, "that for the first time in our history the chief executive officers of the States separately, and of the States together forming the Nation, have met to consider it. It is the chief material question that confronts us, second only—and second always—to the great fundamental question of morality." Thus T.R. opened the first Conference of State Governors, when it met on his call on May 14, 1907. Conservation thinking had been growing, but that date is as good as any for selection as an official launching point of the conservation movement. In recognition of this, a bipartisan group of 13 House members have joined in a Joint Resolution to create a National Conservation Memorial Commission that will, in 1957, carry out a comprehensive plan "for the observance and commemoration of the fiftieth anniversary of the birth of the conservation movement in the United States..." Senator James E. Murray of Montana sponsors the resolution in the Senate, and Hon. Frank Thompson, Jr., of New Jersey in the House, where he is joined by Katharine St. George, New York; B. F. Sisk, California; Harris B. McDowell, Jr., Delaware; Thaddeus M. Machrowicz, Michigan; Cecil R. King, California; T. James Tumulty, New Jersey; Thomas Ludlow Ashley, Ohio; William B. Widnall, New Jersey; Hugh J. Addonizio, New Jersey; Peter W. Rodino, New Jersey; Stewart L. Udall, Arizona, and Lee Metcalf, Montana.

LITTER IS A NATIONAL PROBLEM, there is no doubt of that. Traveling as we did this summer for more than ten thousand miles and in twenty-one States, it was saddening to see what Americans have done to their roadsides. Being a member of the advisory board of Keep America Beautiful, we were especially aware of the great numbers of discarded beer cans, assorted empty bottles and the white spots of cleansing tissues along the sides of the highways. More arid areas in California, Nevada, Arizona, New Mexico and Colorado were perhaps the worst, possibly because there is little cover to hide the evidence of public thoughtlessness. We saw many beautiful places that will linger in our memories, but, unfortunately, one scene that will never blot out was a stretch of "beach" on Route #101 a bit south of Long Beach, California. This was the most disgraceful sight we have ever seen. Besides the careless litter of motoring Americans, the commercial litter of signboards in scenic areas, on curves, on approaches to communities, which were cheapened by such parasitism, was appalling. As a people we should be ashamed of ourselves.

HERBICIDES ARE A MENACE, TOO, as we too frequently saw in our travels. The development of these powerful chemicals has loosed the spray gun on our roadsides. It seems the growing policy of highway departments that all wild flowers and colorful shrubs must go from the immediate environs of the roadsides. Not only is the beauty of highway travel thus being destroyed, but also cover for small mammals and food for birds. As we have before remarked, it would appear that Keep America Beautiful might well consider changing its name to Make America Beautiful.

CONGRATULATIONS TO GOVERNOR LAUSCHE of Ohio. who vetoed a law that would open up State-owned lands to "experimental" or "controlled" shooting of quail. This was an entering wedge seeking to break down the protection Bob White has enjoyed in that State. The Governor said that the quail is a songbird and should not be shot. R.W.W.

FOG

PHOTOGRAPH BY ARTHUR NEWTON PACK

Mark Twain notwithstanding, we are doing something about

The Weather

FROST

ALTHOUGH it is the oldest and probably the most threadbare topic of conversation known to man, the "state of the weather" still remains one of his top interests, ranking only slightly below food, shelter and clothing.

Once man could dodge the elements by seeking refuge in a cave. Then he learned to raise crops, manufacture and sell goods, go on picnics, travel by ship, highway and railroad, and fly in the air. So sun, rain, hail, fog, snow, and wind came to influence his plans, and to menace his property and personal safety.

Thus, today, we find predictions of the weather a *must*. The weather forecast is one item of news that never fails to make the front page of the daily paper. It is featured on the programs of every radio and TV station. Americans spend more money on phone calls to get the latest weather recordings than Congress appropriates for the operation of the U.S. Weather Bureau itself. Businesses affected by weather subscribe to the daily weather maps and the 30-day outlooks published by the government, and spend additional sums for forecasts by commercial weather prophets.

Yes, weather data is not only everybody's business, but today those collecting and interpreting such information comprise a sizeable enterprise in themselves. Mark Twain's famous remark, "Everybody talks about the weather but nobody does anything about it," is as dated as yesterday's meteorological report.

Weather and the weather makers, as a matter of fact, have been very much in the headlines in recent months. Hurricane Diane and her nefarious sister stole the spotlight in August this year. Less spectacular, but still very much in the public eye, are efforts at artificial rain-making, an experiment that is still in a highly controversial stage. More important to the average American citizen, perhaps, are the great strides that have been made in truly scientific forecasting and in the development of instruments that help man to overcome the obstacles placed in his path by rain, snow, fog, winds, and sleet. Not only has the accuracy of daily forecasts been vastly improved, but they are now sys-

By E. JOHN LONG

Photographs, unless otherwise credited, from U. S. Weather Bureau.

LIGHTNING

U.S. FOREST SERVICE PHOTOGRAPH

tematically being projected farther and farther into the future. Furthermore, weather reports get to the public faster and oftener—very important if a hurricane is headed your way!

"Forewarned is forearmed," is an old military slogan, and it has been standard operating policy for the U.S. Weather Bureau, a division of the Department of Commerce, ever since Congress set up a national weather service in 1870. Few persons realize that weather forecasting was not possible until the invention of the telegraph. Shortly after the first inter-city lines were strung in 1844, operators would open their circuits in the morning with chit chat about the weather. Then someone suggested that these reports, and warnings of storms, be assembled and made available to the public through the daily newspapers.

Thus was launched a service that has been of inestimable value to farmers, shippers, transportation companies, and innumerable small enterprises, to say nothing of you or me in our daily lives. The U.S. Weather Bureau's headquarters in Washington each day receives teletype reports from 600 places in the United States, and several hundred more from foreign countries. These reports give temperature, air pressure, humidity, wind, and data about other local conditions.

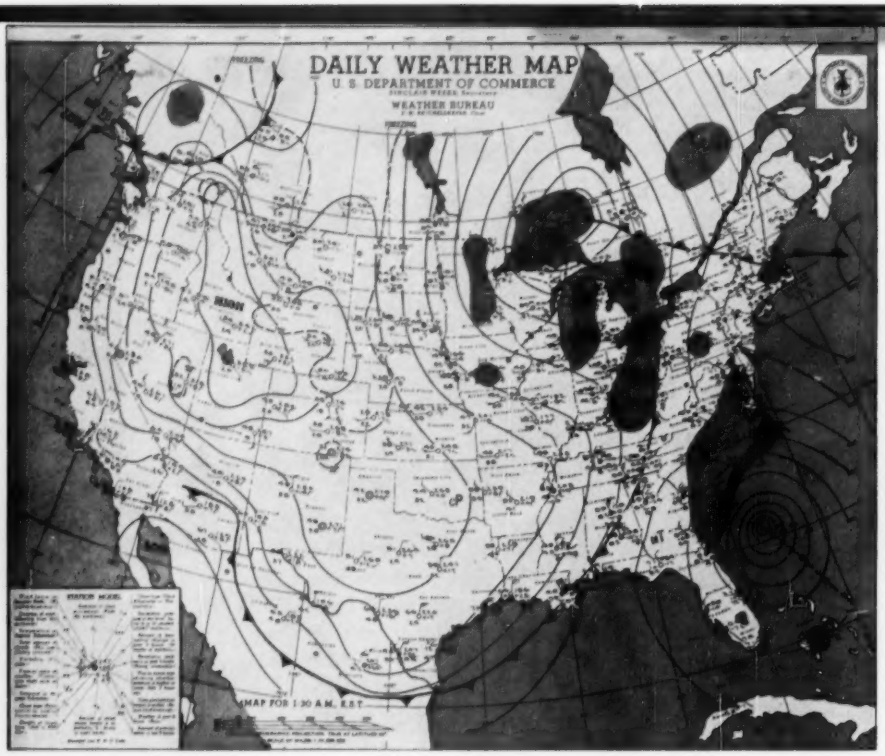
Since 1937, and the rapid development of aviation, the Bureau also receives regular reports of winds, temperatures and pressures to heights of fifteen miles or more. About forty-five stations in the United States now obtain these data by radiosondes or rawinsondes, carried aloft by balloons and equipped to send signals by radio.

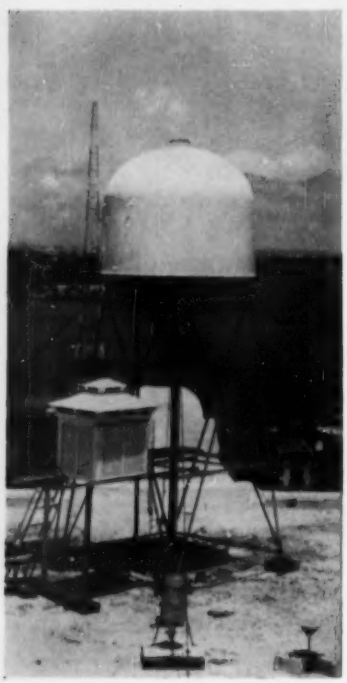
Radar, that all-seeing eye of World War II, has found a peace-time job spotting approaching storms. Just as enemy planes and ships once showed as "pips" on radar screens, rain storms, clouds and even hurricanes can now be picked up within a 200-mile radius and their courses followed or plotted. The Weather Bureau has re-engineered twenty-eight Navy-surplus radar installations for field weather observations, and more are planned.

Those who earn their living from the soil—farmers, foresters, cattle raisers—are still the best customers for the Bureau's daily and long-range forecasts, but aviation is crowding them for attention and special services. To help make flying safer and more dependable in all kinds of weather, the Bureau has developed several ingenious instruments.

One is called the rotating beam ceilometer. It takes the guesswork out of ceiling estimates because it gives cloud heights accurately and automatically. Until

SNOW





The familiar daily weather map showing current weather conditions and trends. At the left (top), GMD-1-type radio direction-finding equipment used to obtain winds aloft information. This equipment automatically tracks a balloon-borne radiosonde. Left (center), an observer is about to release a rawinsonde attached to a balloon. A second observer is seated on SCR-658 radio direction-finding set and will track the rawinsonde in flight. Left (below), the plastic dome houses a 72-inch radar antenna.

recently, airports had no way of determining the true limit of visibility on their runways. So Bureau scientists came up with a transmissometer, which may also prove useful on highways, such as the New Jersey Turnpike, sections of which are subject to sudden fogs and smog.

It was once said that the Weather Bureau would hire no women but blondes, using strands of their hair in delicate humidity-measuring devices. True or false, blonde tresses are passe, meteorologically speaking. Humidity is now measured by a gadget with the imposing name of infra-red absorption hygrometer.

All of these instruments do individual jobs. The pride of the Bureau, however, is a package-deal known as the Automatic Weather Observer, of which two are now in field operation. These unmanned weather listening posts are designed to fill gaps in the present reporting network. A simplified version of the A.W.O. will be placed on mountain tops and on lonely offshore islands, where commercial power is not available.

The basic principles of the Automatic Weather Observer were developed by the Germans during World War II. The Germans installed them in buoys released from submarines. The weather data they sent back to Germany by radio proved of great value, not only in German submarine operations, but in forecasting weather for the battle fronts.

The Weather Bureau's Automatic Observer is a greatly improved version of this German prototype, a Rube Goldberg contraption capable of sending automatic reports on temperature, humidity, wind direction and speed, air pressure, precipitation, and the like. It needs servicing only once every three months.

Already these Automatic Weather Observers have been hooked directly into the Bureau's teletype network. The two Automatic Weather Observers now in operation are located at Park Place, Pennsylvania, and at Sandberg, California. Pioneer installations at Flamingo, Florida, and on two uninhabited islands of the Bahamas, have been discontinued.

In addition to daily weather forecasts, which the public may obtain free through their daily newspapers, radio or TV programs, certain Weather Bureau offices issue special forecasts for airplane pilots, for forestry units fighting forest fires, and for fruit-growers to protect their crops against damage from frosts.

Twice each week, also, a forecast of the weather expected during the next five days

Above, current weather sequence, weather maps and charts and forecasts are displayed for public use on this counter. Below, the office instrumentation at the Weather Bureau central office observatory. Reading from left to right we have first the multiple register, recording miles of wind movement, wind direction, sunshine duration, recordable precipitation. Next, partially obscured, plotting board for pilot balloon soundings. Then a short-wave radio receiver for broadcast monitoring and receipt of time signals. In the next panel is a circular-chart, solar radiation recorder (above) and totalizing indicator (below). Then wind speed and direction indicator, "Windial" anemometer and wind vane and a telepsychrometer recorder. The other center panel contains more wind speed and direction recorders. In the next (top) is a "Wallace and Tiernan" precision aneroid barometer, (center) a "Friez" microbarograph; (below) a ceilometer recorder. Two adjustable-cistern mercurial barometers, and, finally, a continuous wind speed recorder for pressure-type, "Dines"-type, anemometer.

is released from the principal Weather Bureau offices. Twice a month, on the 1st and 15th, an "outlook" is published, giving the average conditions of temperature and precipitation to be expected during the next thirty days. For this twice-monthly publication the government charges $2.40 for 6 months, or $4.80 a year, postpaid.

The oldest of all Weather Bureau functions is the publication of a daily weather map, based on observations taken at 1:30 a.m., E.S.T. This map is sent by first class mail to thousands of libraries, schools, and persons interested in meteorological information.

The backs of the maps, once blank, now carry illustrated articles of special meteorological interest, written in simple language, and have become as popular as the weather maps themselves. This publication is also charged for at sixty cents a month, or $7.20 a year.

Fastest growing of all weather services, however, is that provided through the telephone company—a recording based on the latest local forecast. By dialing a number, listed under "Weather Bureau" in the telephone directories of ten of the large cities in the country, temperature and humidity at each hour, and a forecast of weather conditions for the next twenty-four to forty-eight hours may be obtained.

In Washington, D.C., a record number of 273,320 calls for weather information

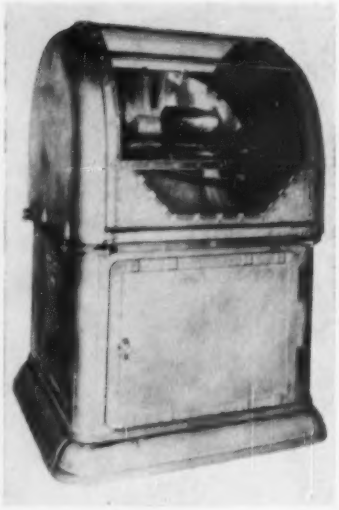
were made in a single day, October 15, 1954, during Hurricane Hazel. This total might have been even higher had not some lines gone out during the big blow.

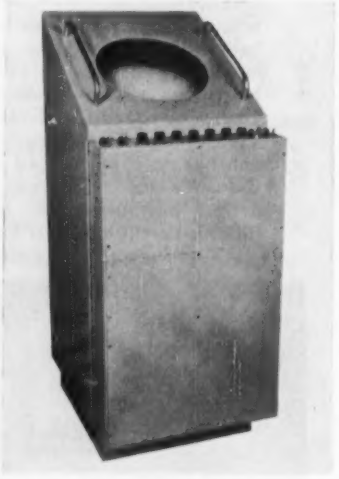
Hurricanes, tornadoes, heavy snowfalls, and heat waves not only keep the Weather Bureau on the jump obtaining and correlating data as rapidly as possible, but they also stimulate public interest in the service. So the telephone recording takes a big load off the Bureau's own communication systems. It also performs a useful service for scores of small businesses and other groups interested in ordinary changes in the weather such as rain, fog, wind direction and force.

Take the bakers in New York City, for example. They follow the 24-hour forecasts very closely. If a dull, rainy day is predicted for tomorrow, a large percentage of the bread, cakes and pies baked during the night are sent to city stores. But if the forecast is for dry, sunny weather, extra bakery products are rushed to the suburbs. Why? Housewives do not like to shop in the rain, so they phone to husbands at work in the city to drop in a bakery shop after they leave the office and pick up a loaf of bread or a cake.

Forecasts of a heat wave mean that baby rabbits must be taken out of fur-lined boxes and placed in a cooler spot. Auctioneers want fair, mild weather for successful outdoor sales. If a cold snap is in prospect coal dealers will begin to load trucks directly from freight cars instead of storage piles. Candy makers will not make deliveries if the forecast calls for temperatures above 87 degrees. Pigeon racers want to know if they will have favorable winds as well as fair weather.

Long-range forecasting, both Government and private, is still largely in the experimental stage, but it has become accurate enough to induce certain heavy industries, utility companies, transportation lines, construction and clothing interests to try to turn it to their advantage. Some commercial meteorologists claim that they can predict weather, within 75 percent accuracy, from six months to a year in advance. Quite a few big companies now have their own staff meteorologists; others buy the services offered by meteorological firms. The possibilities here are unlimited—clothiers would like to know whether to stock up on bathing suits or sweaters for a given June, or oil companies ask if they will need extra help in December or January. Makers of air-conditioning equipment wonder if summer will be hot or moderate in a certain area.





The rotating beam ceilometer projector projects a beam of light that forms a spot on the cloud base above the detector, and the rotating beam ceiliometer indicator (below) readily indicates the height of the base of the clouds above the detector.

How does a weatherman work out a daily forecast? We have come a long way from the day when man used to moisten a finger in his mouth, thrust it skyward to test the wind, read the thermometer and barometer, looked at the sky around him, and make a guess. A modern weather prediction involves collecting accurate information from scores of sources, analyzing it properly with the help of mathematics, and plotting it in abbreviated form on maps. Finally, however, the forecaster must also use his judgment, because there are factors in every decision that just cannot be determined by the slide rule. Perhaps, when more basic data becomes available, electronic computers may really anticipate a flash storm or a surprise snow.

A modern daily forecast is derived as follows: First, weathermen must get precise data (temperature, air pressure, wind, and other conditions) about the state of the weather on the ground from thousands of reporting stations in this country and elsewhere in the hemisphere, including ships at sea. This information is plotted in an abbreviated form on maps. From it, the weather expert is able to trace the development and movement of major weather "systems"—areas of winds, clouds, fronts and rainfall.

Second, the weatherman must assemble data from 150 "upper air" stations, obtained from robot balloons that send information about conditions 10,000 to 14,000 feet above sea level to ground observers. Thus he learns about the actions of vast planetary waves of wind that catch and steer the smaller systems of weather closer to the surface of the earth. These planetary waves can push warm air up from the tropics and cold air down from the polar regions.

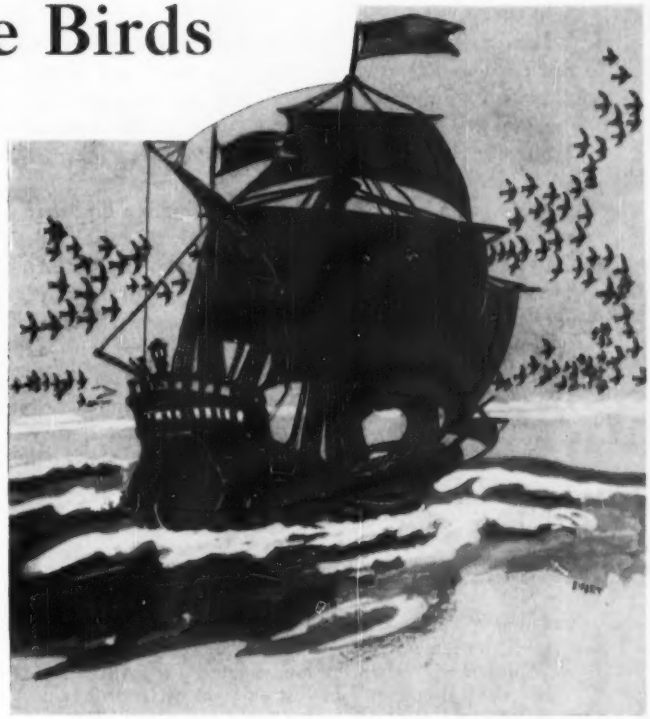
Third, and here the weatherman is getting into something he does not yet understand very well himself, he must get what information he can about the jet streams. Discovered during World War II, when B-29 Superfortresses flew at very high altitudes over the Pacific, jet streams are long, narrow currents of air travelling at speeds of from 100 to 300 miles per hour. They are the cores of the planetary waves.

Every six hours the weatherman must analyze this potpourri of statistics, throw in a (*continued on page 442*)

Columbus and the Birds

By VIRGINIA S. EIFERT

Illustrated by the author



"Suddenly, on October 7, 1492, great numbers of land birds were seen flying from the north to the southwest . . ." and it was for this reason that Columbus gave up the due-west course to which he had held so stubbornly, and shaped a course west-southwest. The birds, therefore, determined where the ships of Columbus eventually landed.

It was birds, not chance, that determined the spot which Christopher Columbus discovered on an October day in 1492. For nearly a month, the *Nina*, the *Pinta*, and the *Santa Maria* had been sailing west on a terrifyingly blank and trackless ocean, and still no land was in sight. Then, suddenly, on October 7, 1492, great numbers of land birds were seen flying from the north to the southwest. This, the men decided eagerly, meant that the birds either were going to sleep on land or were flying from the winter of a land close by.

The Admiral was well aware that most of the islands held by the Portugese had been discovered by following the flight of birds. According to his journal, it was for this reason—the birds of America leading and directing him—that Columbus resolved to give up the due-west course to which he had held so stubbornly, and shaped instead a west-southwest course on the two following days. Birds, therefore, determined where Columbus eventually landed. They determined much of the whole course of history, for if he had continued on his original route—if he had ignored the birds or had not seen them at all—he might have landed on the Florida coast, where he and his men might have found a less hospitable land, less friendly natives, and fewer resources. But because he veered west-southwest . . but he is not there yet. It is only October 9.

The men shouted the news of a royal tern and a boatswain bird, or tropic bird, with its long slim tail-quills.

It was on September 6 that the three little Spanish ships had left the Canary Islands. Before them lay the wide, unknown sea. Daily, Columbus practiced a little deception on the anxious crew. In setting down in the log the number of leagues traversed, he always set down fewer than they actually had gone, so that the crew would not think they were as far from Spain as they actually were. And he encouraged them to watch for birds; birds, he reminded them, never went far from land.

And so, in a few days, the men shouted the news of a royal tern and a boatswain bird, or tropic bird (Phaëthon), with its long slim tail-quills. These birds were like seeing a face from home, and the men brightened perceptibly. They watched eagerly for the ever-imminent land, but day after day went by, and night after night, with the stars going over in a vast dark sky and the lonely sea coming endlessly at the three little Spanish hulls that pushed ever westward under a fair wind. No land at all came in sight. But birds, provokingly enough, were seen almost every day.

"September 18. Martin Alonso Pinzon of the *Pinta* saw great multitude of birds flying westward, and he hoped to see

land that night."

Next day a booby, called *Alcatraz* by the Spaniards, came down and rested a while on a mast, and in the afternoon another arrived, and they sat there looking down at the men. Now, surely, thought the Admiral of the Ocean Sea, praying, land cannot be much farther when birds come down and sit on the ship.

At dawn on September 20, the men caught a bird that was like a tern. But it was a river bird, they declared, not a seabird, for the feet were like those of a gull. At dawn two or three land birds came singing to the ship, but they disappeared before sunset. The men yearned after their little visitors, wishing they knew with as much assurance where they were going as the birds seemed to know in the trackless waste of sea and sky.

On September 29, the Admiral's journal states, they saw a bird called *rabiforcado*, the man o' war bird "which makes the boobies vomit what they have swallowed, and eats it, maintaining itself on nothing else. It is a sea bird, but does not sleep on the sea, and does not go more than twenty leagues from land."

Columbus encouraged the men to watch for birds. Birds, he reminded them, never went far from land. Consequently, when the men sighted a royal tern a few days after they had lost all sight of land, they rejoiced as if they had seen a familiar face from home.

The sight of the *rabiforcado* sailing calmly against the splendid blue of the autumn sky suddenly fermented the men's unrest and anxiety to the seething point. There *must* be islands nearby as the maps showed, the men insisted; the seabirds, the big black *rabiforcados*, proved it. But the Admiral refused to go tacking off in all directions to try to find islands that no one had ever seen, and which had been put on the maps merely to fill out an empty area of the unknown sea. The men growled, but the Admiral was firm.

It was a week later, however, October 7, that the Admiral reversed his earlier decision not to follow the birds, when he saw the great flocks, all flying southwest He set the course west-southwest. Throughout the nights that followed, the men heard birds passing overhead. The peak of migration was near, and all night long their high-flung voices passed above the questing ships.

Meanwhile, the men and captains, in unrest and mounting fear, muttered and plotted privately among themselves. Then, on October 10, the captains presented the ultimatum:

"We will continue on the course for three days longer, and no more," they said. "Then, whether you wish it or not, we will turn about and sail back to Spain. We cannot endure this any longer. Fresh water is getting low, food is moulding, what there is left. We must go back!"

Columbus was pale. "You say your water supply is low, your food spoiling. Then how can you expect your men to sail for a month back to the Canaries on such meagre supplies?"

The captains would not answer.

"Three days," was all they would say.

Three days. Three days. On October 11, the sea was running more heavily than heretofore. Petrels skimmed by, following the troughs of the gray-green waves. Men on the *Pinta* saw a green reed and a pole, which they hauled aboard and examined with mounting excitement. It appeared to have been worked with iron There were bits of green cane. The crew of the *Nina* brought aboard a branch of a wild rose bush with red berries—*Escaramojos*, they called them, in delight Everyone breathed afresh and rejoiced at these most favorable signs.

And then, on Friday, October 12, 1492, the three ships arrived at a small island called by the natives Guadahani, and renamed San Salvador by the Admiral. The Admiral and his captains went ashore with two banners of the green cross and planted them in the sand, while the brown people stared in wonder. In the trees, parrots screeched and chattered—parrots which, of all the birds in the New World, very likely, greeted the three ships from Spain.

Feeling that he had indeed found the East Indies, Columbus spent four months in the Caribbean hunting for gold and Japan. Yet in all his intent searching for

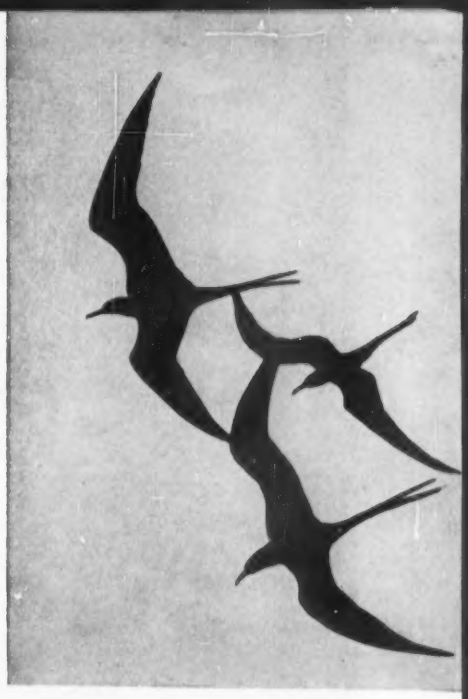
something tangible to take back for the glory of Spain, and for the King and Queen who had financed the trip, Columbus was a man who enjoyed the wildlife that he found. He made not mere business-like mentions in his journal, but fervent expressions of appreciation of beauty and newness and wonder.

"The songs of the birds were so pleasant that it seemed as if a man could never wish to leave the place," he said in his journal. "The flocks of parrots concealed the sun; and the birds were so numerous, and of so many different kinds, that it was wonderful. There are trees of a thousand sorts, and all have their several fruits, and I feel the most unhappy man in the world not to know them, for I am well assured they are all valuable."

Again, he says, "That I have no personal knowledge of these products causes me the greatest sorrow in the world, for I see a thousand kinds of trees, each one with its own special fruit, all green now as in Spain during the months of May and June, as well as a thousand kinds of herbs with their flowers, yet I know none of them except the aloe, of which I ordered a quantity to be brought on board."

Meanwhile, the three ships were having trouble with the ship-worm, or teredo, which was boring holes in the hulls, which were leaking badly. The crew were kept busy at the pumps, and Columbus desperately kept the ships on the move, for he knew no way to stop the worms before they ate the ships out from under him.

The condition grew so bad that Columbus wondered in some fear how they would ever get back to Spain. Nevertheless, with tales of gold on the islands of Porto Rico, they were heading there, when suddenly they hit a wind that was just right for Spain. It fairly called to the little Spanish ships to go along with it, and the Admiral, for the first time, weakened. Gold was all very well, but he doubted if they would find any on this voyage, since they had discovered none so far, nor could they find Japan, and the men were growing more and more homesick. The wind called, and the Admiral made up his mind. They would go home, now, this very day. He shouted his orders and the men cheered, and leaped to the sails, and the fair wind took the battered sails and bellied them out, and the ships of Columbus started back from America for the Old World again.



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But he could not forget America. In his journal he wrote: "Always the land was of the same beauty, and the fields were very green and full of an infinity of fruits, as red as scarlet, and everywhere there was the perfume of flowers and the singing of birds, very sweet. Even the pigeons had their crops full of flowers which were sweeter than orange blossom." He had found the New World, and its birds forever called to him.

THE FALLING LEAF

Waves lapping, lapping, lapping on the shore,
Leaves dropping, dappling, brightening the waves,
Clouds rolling, breaking, patterning the sky,
Swans floating, billowing, dipping like white sails,
Gulls rising, swirling, seeking like my thoughts,
Sun sifting colors upon the snowy peaks,
A dusky merle singing in a yellowed birch —
I stand in contemplation, reverent,
Conscious of the Divine in everything,
Uniting in one wonder wave and leaf,
Song and the glorious sun, approaching night.

L. Moulton

An air view of Victoria Falls in Rhodesia. In the foreground is the Zambesi Bridge.

A century ago David Livingstone first saw

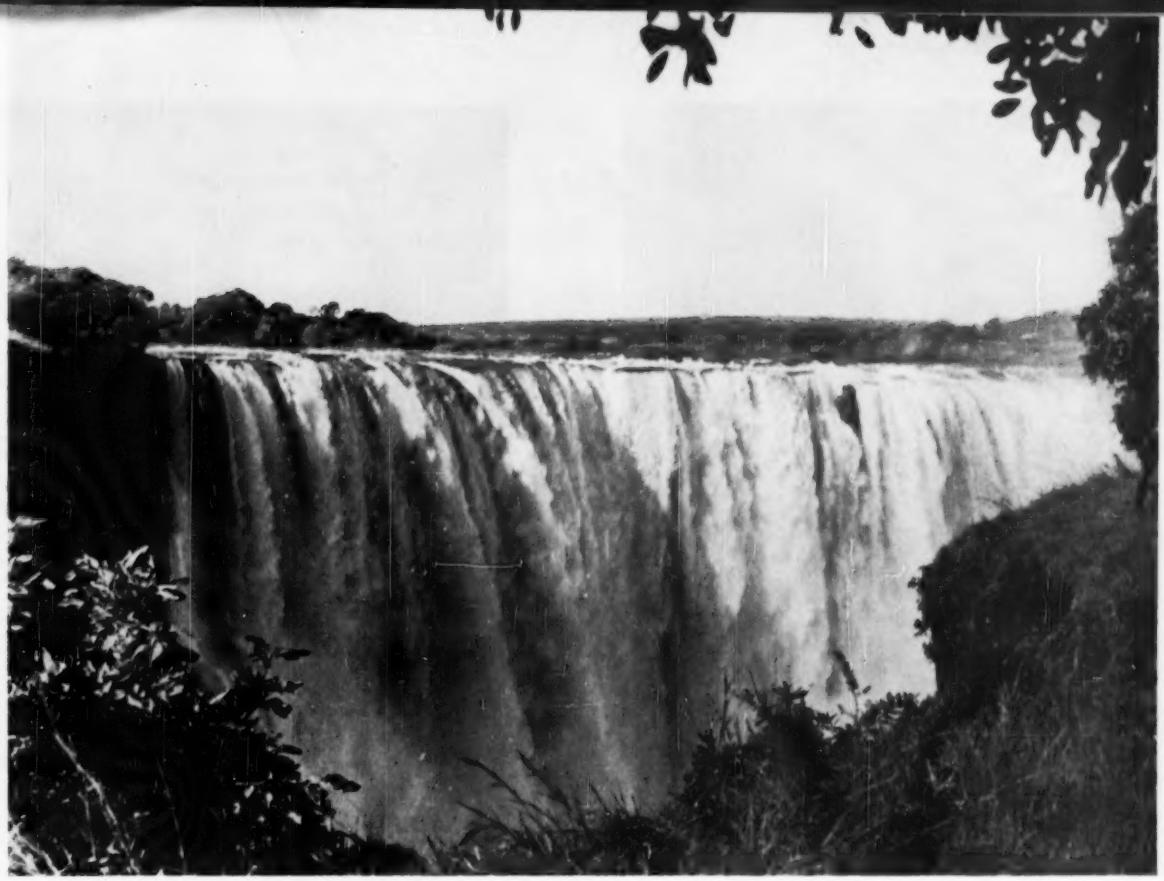
VICTORIA FALLS

ONE HUNDRED years ago David Livingstone stood on a small island near the edge of the gorge into which the mighty Zambesi River was hurling its waters in a mad chaos of sound and spray. The Scot was the first white man to lay eyes on this astounding spectacle. Today, cast in heroic mold with his Bible and his stick, he still stands nearby, still gazes at the struggling waters. But today the Falls, to which Livingstone gave the name of his queen, draw enchanted onlookers from all parts of the globe.

In 1877 Richard Frewin wrote: "This part of Africa will never support a railway and the journey by ox-waggon, its difficulties and fatigues and endurance of hardships will never suit a traveller." How wrong he was! The travellers come comfortably enough by car, by train, by plane; certainly not as Livingstone did, pushing mile by arduous mile through unknown territory, setting his determined feet where no white man had ever ventured. But no matter who the visitor is, no matter how he has made his way to Victoria Falls, he does just what Livingstone did. He stands entranced. Here, indeed, is one of the world's wonders!

David Livingstone began his African career in 1840 as a medical missionary, but by 1852 his consuming interest in this almost unknown land sent him off on eighteen years of intensive exploration. These journeyings, made at such great physical cost, helped materially to illuminate "darkest Africa." When Livingstone stood gazing at the falls, which the natives called *Moisi oa Tunya*, "the smoke that thunders," he rejoiced in their overwhelming beauty, but his scientific mind was also concerned with their size and possible importance in the development of the country since rivers were then the natural highways. On November 17, 1855, he wrote in his diary:

"The falls, a thousand yards broad and a hundred feet deep, are singularly formed. They are simply the whole mass of the Zambesi waters rushing into a fissure or rent made right across the bed of the river. The river ... leaps into it and becomes a boiling white mass



The main fall of Victoria Falls, looking much today as when Livingstone first saw it.

By ELSIE A. PARRY

Photographs courtesy Union of South Africa Information Office

at the bottom, 10 or 12 yards broad... It runs or rather rolls or wriggles from east to west until it reaches what above was its left bank and then turns a corner and follows or rather is guided by the fissure away from its usual route of southeast by east. The lips of the rent are in some parts not more than 50 or 60 feet apart..."

Livingstone thought the crevice to be of volcanic origin, but geologists now believe that it was once a great dike of softer rock that has been eaten away by water erosion.

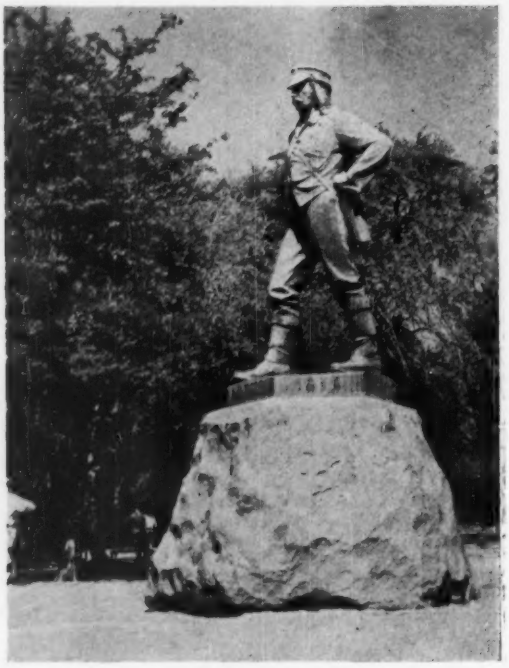
In June, 1860, the explorer returned to Victoria Falls with his brother Charles and Dr. John Kirk. This time the party took precise measurements and found the resulting figures much greater than the rough calculations David had made in 1855. The thousand yards of breadth, for instance, turned out to be eighteen hundred yards, and the depth 320 instead of 100 feet. Today the Surveyor-General's Department of Salisbury gives these approximate dimensions—width, 5580 feet; mean height (the whole Falls), 304 feet. But figures, however impressive, are only coldly descriptive. In his diary Livingstone carefully set down his calculations for the Royal Geographical Society, which had already awarded him a patron's medal, but he made delightful water color drawings of the Falls as well, and wrote, in singing words:

"The snow-white sheet of water seemed like myriads of small comets rushing on in one direction, each of which left behind its nucleus rays of foam. It seemed to be the effect of the mass of water leaping at once clear of the rock and, but slowly, breaking up into spray..."

Other exploring white men followed on the heels of Livingstone. On them, too, the Falls left their impression of awesome grandeur. Richard Frewin called them "the most grand, beautiful, and awful of nature's works," and in 1878 Serpa Pinto, the first white man to cross the African continent from coast to coast after Livingstone, wrote:

"... the Falls are enveloped in a cloud of vapor, which, perhaps fortunately, hides half the awfulness of the scenery... That enormous gulf, black as the basalt which forms it, dark and dense as is the cloud which enwraps it, would have been chosen, if known in biblical times, as an image of the infernal regions, a hell of water and darkness, more terrible perhaps than the hell of

The Boiling Pot in the Corridors of Lime at the foot of Victoria Falls.



Livingstone, cast in heroic statue form, still gazes at the wonder he discovered.

fire and light..."

Lord Curzon declared that "in scenery the surroundings of Victoria Falls greatly surpass their American rival. For every pinnacle and rocky buttress is clothed from top to bottom with a clustering forest growth. The contrast of the white storm of the cataract and the gloomy swirl of the torrent with the brilliant green of the verdure is a fascination that never palls."

Comparison of Victoria Falls with Niagara is inevitable. Again there are figures to consider, and again the figures tell only a small part of the tale. The present width of the American Falls is 1000 feet, the height, 168 feet; the Horseshoe Falls are about 2600 feet wide and 155 feet high. Over the escarpment, from a drainage area covering 255,000 square miles, the Niagara River pours more than 14 million cubic feet of water per minute, while the Zambesi, 750 miles long at this point and draining more than 513,000 square miles, goes over its brink at the rate of 12 million cubic feet per minute. These are the flood stage figures.

Viewed industrially, Niagara and Victoria are as widely separated as are the continents in which they are located. Early in the nineteenth century men began to dream seriously of putting the enormous energy of Niagara to work, and in little more than a century they have succeeded beyond the wildest imaginings of those first dreamers. Today, on the United States side of the Niagara Gorge alone, more than a million kilowatts of dependable capacity can be generated; huge factories crowd the entire area where, in 1748, Chabert Joncaire dug a small ditch and furnished it with a clumsy overshot waterwheel to drive a sawmill—and to harness Niagara for the first time. Today the visitor to the Falls has trouble escaping from the persistent industrial pressure. Wherever he gazes, wherever he points the eye of his camera the civilization of power intrudes on Niagara's grandeur. How different at Victoria! To be sure, there is a railroad here, too, there are cars and a highway, there is a power station, pint-sized, and a hotel not at all pint-sized. But the railroad schedule is light, the automobiles are infrequent, the power station is tucked away at the bottom of the gorge, and the hotel is well out of sight. The visitor has only to step a few paces from a footpath to find himself in a wilderness where wild monkeys feed in the early morning, and where the Falls create their magic wonderland of sound and spray just as they did when David Livingstone first saw them a hundred years ago.

Viewed from the air the differences in geologic pattern created by Niagara and Victoria are apparent even to the untrained eye. These are due largely to differences in the underlying rock structures and to the fact that Niagara is supplied by 6000 cubic miles of water from four of the Great Lakes, while Victoria is fed by 750 miles of the fluctuating Zambesi and its tributaries. The gorge below the Zambesi's falls—a tremendous, irregular "Z," plainly visible from the air—is much more spectacular than the below-falls pattern of Niagara. But the visitor on the ground at Victoria finds himself faced with another and thoroughly frustrating difference—that deep, compressed gorge is relatively so narrow that it is impossible, from any point of view, to see the falls in their entirety. He is forced to agree with the Afrikander who, viewing Niagara for (*continued on page 444*)

This coast mole, *Scapanus orarius*, is posed alive to show the rudiments of an eye. The apparent yellow iris is merely bare skin.

Another pose of the Pacific Northwest mole. In the wilderness the dweller in the soil is valuable in creating his own habitat.

Life and Lore of the Mole

By THEO. H. SCHEFFER

There are comparatively few mammals that find both life and a living *within* the soil. Such in-dwellers would not even include all burrowing mammals. Some, such as the ground squirrels, disport themselves in the sunshine for a brief season, feeding and breeding there and then retiring to mother earth for a long period of dead-to-the-world. We call this aestivation. Such in-dwellers, however, include a common type of small mammal in the more humid parts of our northern climes in America and Europe—the mole—and a less widely distributed genus—the pocket gopher. The former is strictly a hunter; the latter a miner who works out his lodes of roots and rhizomes, only to abandon them later.

The mole has a couple of cousins among the insect eaters—the bat and the shrew. The bat has rather the best of the game in abundant living, in that it has taken to wing and may enjoy the changing moon and twilight landscapes while it listens to the drone of insects that it pursues for food. The shrew is a shrewish little animal, common as the mole but so insignificant in size as to escape our attention, unless the cat brings one in as a trophy. Cats are choicy in their food and will not eat shrew or mole. Neither will an owl, which cannot even fool its fledglings with such food, although in the semi-dark of a barn loft.

The shrew often is reported by casual observers as a baby mole. In fact, shrews may commonly be taken in mole runways, where they live by sufferance of the mole, and to some extent on crumbs from the mole's table, for they are of like food habits. But a young mole looks more like a pink hippopotamus in miniature than a tiny, adult shrew.

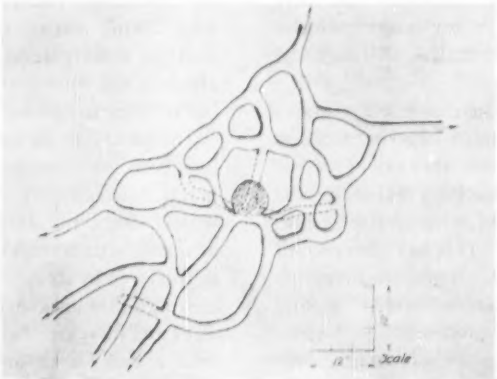


Diagram of the burrows and nest of the Townsend mole of the Pacific Northwest. The dotted lines simulate the "bolt runs" noted in England. These are for quick get-away and beneath the level of other tunnels.

When considering the mole's ways of life we must take into account the doings of certain small mammals, other than the shrew, that frequent a mole's runways. More commonly these guests—trespassers from the mole's viewpoint, if he had eyes,—are meadow mice and their kin that may be trapped "red handed" in a mole's highways. Any country boy may verify this by setting ordinary mouse traps in mole

Mole hills of the Townsend mole, *Scapanus townsendi*, on the glacial outwash prairies just south of Puget Sound, Washington. These hills persist longer than others because there is gravel mixed in the soil.

(Below) Baby moles of the Townsend species. These triplets are just a few days old. They develop rapidly, growing rapidly as young robins and at the same time, and both young moles and young birds will soon seek out earthworms, one from the surface and one below it.

runways and covering the opening, through which the trap was introduced, with a piece of sod or a board. He will need to re-set the trap if the rightful owner of the run comes along first and packs the trap with dirt.

Although Shakespeare was not a scientist of note, he was close enough to the truth when he wrote, in *The Tempest:* "Pray you tread softly, that the blind mole may not hear a footfall:"

The matter of sight in a mole is one of argument among scientists. All of them may be partly right. For of three genera that have come under rather close scrutiny, the Townsend mole and the Coast mole of the Pacific Northwest—genus *Scapanus*—certainly have rudimentary eyes and can "bug them out" when annoyed. This they do by radiating and flattening out the fur about the tiny eye structures. The apparent iris showing about this central bead is, however, merely bare skin. The same sort of structure and adaptation is recorded for the English mole—genus *Talpa*—although earlier observers over there reported that seal of the mole's eyelids was broken only in death so that he might see what he had missed in life. Further degeneration of optical parts seems evident in the genus *Scalopus*, of our middle West and the East, where research study indicates that there are no functional eyelids. The eye slit is anatomically closed, and we have a truly "blind mole," although not Shakespeare's.

What other moles may see in their rare forays above ground, or when annoyed by human experimenters, is a matter of pure conjecture. At best, they could see but darkly and at very close range. Lacking real sight, the mole's sense of hearing, associated with contact vibrations, must be, conversely, acute. This has been proved by experiment with captive moles. Ingenious inventors have devised little clattering windmills with ground contact to drive moles from the premises. Still more ingenious is the fellow who recently advocated, over radio, the placing of large, open-mouth bottles along the mole runs. Soughing of the wind over these open bottles will produce the effect of a Banshee's warning of what dallying moles might expect if they stuck around too long.

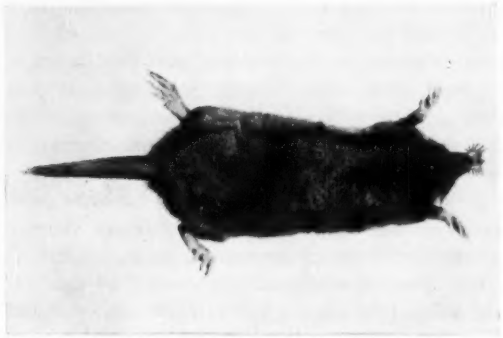
The question may arise—often does—as to why banish the mole, or certain other types of wildlife, from the lands of our using. The mole has his place and function in the biota of the land; the same, in theory, as the robin. And therein is a curious parallel of circumstance. For food, bird and mammal pursue alike the much harrassed earthworm; the "early bird" commonly in the morning, the mole at night, or just any old time. And the earthworm itself is playing an interesting and imposing part in enriching, aerating, and draining the soil! To follow the parallel still farther, the robin and mole build their nests and rear their young in the same short spring period, in the Pacific Northwest at least. And the rapidly developing mole "cubs" are blundering about in the runways just as the fledgling robins tumble out of their nests—to attract the prowling cat.

The mole has the edge over the robin here. If the cat has been successful, the robin will, by instinct and practice, usually try to rear a second brood; while the mole's domestic duties are shortly over with, and offspring will be making their own living. The mole is so sheltered by its secluded life, and so free from predation because of its unsavory appeal to the taste, that replacement and increase of the race is a matter of breeding only once a year, with an average litter of three or four. This holds true of American and English moles.

Biotic relations of the mole in the soil and of the soil must be considered apart from the animal's effect on man's interests. In the wilderness there was the mole and the shrew, the meadow mouse, the earthworm, the

Aberrant color patterns are frequently found in moles, although why Nature so provides is a mystery since the sightless creature has no need for the allure of color. This illustration from early Audubon print.

(Below) The star-nosed mole, *Condylura cristata*, is a distinctive type of mole, more commonly found in damp meadows and marshes in southeastern Canada and northeastern United States." This specimen was taken near Washington, D.C., in the spring, at which season its tail is enlarged.



beetle larvae, the ant, and whatnot. Working together with the flora, they created soil—the mole ate earthworms and the beetle larvae, particularly, and roamed widely in the soil in search of its food. Thus better drainage was effected, better aeration provided, and practical cultivation secured. But when we tillers of the soil came on the scene we asserted dominion. We resented moles dumping earth mounds on our orderly landscaped grounds, or heaving up unsightly ridges in our gardens, to say nothing of uprooting and destroying our choice plants. But moles should be allowed to continue to work their will and ways in wildlands, perhaps even in pastures, as they have been wont to do. If we drag down the mounds occasionally in the pastures, we have cultivated the range, a beneficial practice.

History and traditions of the mole, in literature, are as old at least as Aristotle of the Greeks, and as recent as this story. Most of the earlier writings were tinged with superstitions and embellished with fanciful legends. The mole, living in darkness, was saddled with deeds of darkness, and there were few of inquiring mind to prove otherwise. "Old mole" was digging somewhere about when the ghost of Hamlet's father walked the night, at the hour when:

"The glow-worm shows the matin to be near
And gins to pale his uneffectual fire."

If there were an "old mole" about at this hour, which is not at all unseemly for a mole, he probably was looking for the glow-worm.

One English writer reports that the mole "comes up but once a year, in daylight, to get a breath of fresh air." We would not know about that, as the rule in Lincolnshire, but we do know that moles travel their underground hunting paths at all hours of the day and night because they register at repair points in their broken runways, a fact we checked in daylight and by flashlight. And we know that they come to the surface on warm, moist nights to overtake the earthworms, which also are there at such times to get a bit of green stuff. We have seen shallow, often entirely exposed, shuffling mole trails on smoothly cultivated land, or their outlined paths at morning in the gray mantle of dew on a lawn. And these moles were not "moon struck," as sometimes reported in England, for their nocturnal wanderings were undertaken alike in the light or in the dark of the moon.

By far the greater number of superstitions and legends concerning the mole have derived from reported methods of controlling or destroying the animal on lands that are intensively cultivated, as in western Europe and the British Isles. The hand of man has ever been against the mole, whether his deeds be *in* the darkness or *of* the darkness. Trapping or snaring the mole was at one time an honorable profession in England, with humble guilds to promote the business. Profits accrued to the trapper from bounties paid by estate owners and from a pittance received for the pelts, which have been quite in demand by milady, at times.

We would like to make a suggestion to an English writer who prepared a diagram of a mole at work building a mole hill. What he depicts above ground is absolutely correct, and a matter of competent observation. But that part of the diagram below the surface seems to show faulty deductions. He shows the animal pushing the plugs of excavated earth up through the center of the mound, mainly with his slender, sensitive snout! That is like the loser in an *(Continued on page 444)*

Serpents

By BRYAN MARVIN

The "sea-serpent" takes a bite, although its teeth, projecting forward and downward, are not visible. The animal's head is distorted by the eversion of the jaws.

SEA-SERPENTS, as everyone knows, are nautical monsters. Through the centuries these figments of vivid imaginations have been described in various forms, all frightening. However, these tales belong in the realm of folklore, but there really is a "sea-serpent." It is the clam worm, *Nereis virens*, which flourishes along the coast of many hospitable shores. One Connecticut beach colony was thrown into a furor recently by the rumor that there was a nest of baby sea-serpents in one of the tidal pools on a nearby rock promontory. Young and old swarmed to the barnacle-covered rocks to see the nest. Sure enough, in a tiny pool left by the receding tide, segmented worms crept from the rock crevices to grab morsels of food and withdraw quickly into their burrows.

Viewed through a magnifying glass, these worms are terrifying. The males pale copper, the females reddish copper, they have a metallic sheen. The heads are an assembly of tentacles, with two jutting feelers bigger and better than the rest.

The two large feelers rove constantly ahead of the worm, searching out its path, probing empty barnacle shells and feeling the closed tops of occupied shells. The smaller tentacles are evidently warning devices like cat's whiskers, necessary to the worm when fishes such as the tautog or scup probe the rocks and mud in search of food.

The worm gets about thanks to an extremely efficient set of paddles. These are mounted in pairs on each segment of the worm, one to port and one to starboard. Each paddle consists of a major, unjointed unit so that the individual worm can not only walk across the bottom but also swim in the water with an undulating motion. On the rear fifth of the creature the paddles are differently shaped, flat and leaf-like.

The largest worm in the tidal pool was four inches in length, with more than seventy segments. In less hazardous feeding grounds, they sometimes grow as long as eighteen inches, with more than 200 segments in their body.

It is the action of the tide itself that is both the curse and the major blessing of a tidal pool. In the vicinity of the sea-serpent pool, the average tide is 7.2 feet. Spring tides produce a difference between high and low water of 8.5 feet, while neap tides reduce the rise and fall to 5.8 feet.

Bathers at the nearby beach are mostly unaware of the difference between spring and neap, but in the tidal pool the variation is a life and death affair. At the height of a spring tide, the pool is buried under extra water. In the case of a neap tide, the pool is under a foot and a half less water. Since the tide brings food in the form of plankton, those floating animal-vegetables, a spring tide represents an extra foot and a half piled on the dinner plate compared with neap tide.

The higher tide also insulates the pool against the action of the surf, a general hazard to life on any rocky coast. Even on a calm day the tidal pool is buffeted by waves four times a day for periods of twenty minutes. On rough days, when the water is disturbed to a greater depth, the tumult lasts even longer.

Neap tide, with its shorter food ration and with its minimum protection from the wave action, is a time for dying in the tidal pool. Spring tide, with all its benefits, is a time for birth.

On the average, the sea-serpent pool is under water for seven and a half hours a day. It is entirely out of reach of the waves for a little more than fifteen hours. Salt water that has soaked into openings in the rock higher up trickles out slowly through the pool and back into Long Island Sound. But even with this cooling effect, temperatures in the exposed pool often rise above 100° F. under the summer sun. Then, as the tide returns, the

in the Pool

Photographs by the author

The "sea-serpent" examines a penny placed in the tidal pool by the observer. The structure of the creature's "legs" is apparent here.

pool temperature drops as much as 50° F. in a matter of eleven minutes as waves from the main body of water splash into it and finally connect it with the sound.

With the first wave, the acorn barnacles slide back the doors of their observatory-shaped, limestone houses and begin feeling frantically for food. They are crowded on the rock walls and can only maintain their position by growing at each other's expense. The one who eats the most will grow the most and push its weaker brothers off the rock.

In addition to barnacles, this particular pool is inhabited by edible mussels, black and shiny, and by hooked mussels, smaller, with ribbed shells edged in shades of brown. Every now and again during low tide one of these mussels takes a gulp of water, sending an eddy through the pool. But they save their real appetite for high water and the arrival of wavefuls of fresh plankton. The exposed tidal pool contains less than a pail of water and this is soon strained clear of plankton by the active barnacles.

Between tides the pool really belongs to the formidably armed clam worm—the serpent in the pool. The worm has a pair of powerful teeth. When not in use, these teeth are located back in the beast's throat. But when it desires to take a bite, the worm turns its whole jaw structure inside out so that the teeth project in biting position. The action is performed quickly and is accompanied by a bulging of the animal's head.

The biting action is the same convulsion in reverse. As the teeth return to their storage position in the throat, they perform the same function as the swallowing muscles in a human, sending the bite of food on down into the worm's digestive tract.

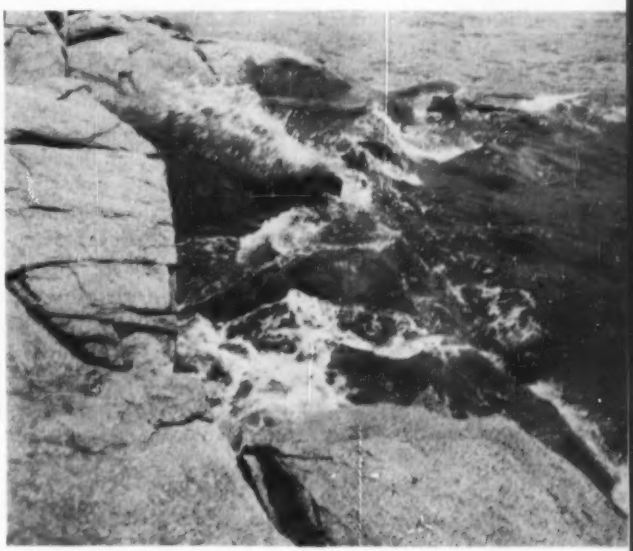
From the way the snails in the pool jump whenever a clam worm nuzzles the edge of their sticky feet, there is no doubt that the worms are meat-eaters. They are aggressive and have been known to destroy animals many times their own size. But at the same time they will eat vegetable matter. During the summer, a clump of grass-like green seaweed, *Chlorophycea*, advances into the tidal pool. Stretching from their burrows, the worms bite off a strand of the algae and pull it back to the entrance of the hole in which they live. There it floats, moving jerkily as the worm eats it leisurely, bite by bite.

The worms obviously prefer their burrows to the floor of the tidal pool. If the object being eaten can be hauled back like the seaweed and devoured in peace, they will do this every time. Even a dead baby crab was treated in a similar manner, and when the observer moved it a few inches from the worm's hole the worm promptly came out, reclaimed his lunch and hauled it back into eating position.

Clam worms live in interstices in the rock. Working themselves into channels between the rocks and mussel shells, they exude a translucent material that hardens into a sheath. This they call home until they outgrow it and have to move to more spacious quarters. The little stumps that serve the worm as legs and fins also enable it to pop in and out of its burrow at an anazing speed.

The clam worm breathes by means of the differently shaped legs near its tail. These extract oxygen from the water as do a fish's gills. Every now and then, when the worm's appetite is satiated, it will emerge from its burrow, execute a U-turn, and re-enter the abode head first. Up to an inch of the tail will remain outside,

The tidal pool home of the clam worm as the waves break over it.



looking exactly like the tip of a fern with matched pale olive leaves projecting on either side. The casual observer may take it for such, until the "leaves" suddenly begin to wave as the worm stirs up the pool in search of oxygen.

The anatomy of the clam worm is a study in monotony. Each segment is nearly a duplicate of every other one. The digestive system is a straight tube from front to back. The blood system is also simplified with one large vein along the stomach and another along the back.

Each segment is divided from the one fore and aft of it by a membrane. The segment is equipped with its own muscles and its own body cavity, even with its own reproductive organs. In both male and female these take the shape of pore-like holes in the body wall. Through these holes the reproductive agents escape at breeding time.

This time is limited to a single interval of high tide, and during it the worms display an amazing amount of consciousness. In substantial numbers, they pick the same high tide, and usually one closely following a high spring tide.

The clam worm completely changes its character for the duration of this tide. Feeding, its primary occupation, is halted. The creature's veins are emptied of blood and filled with oxygen so that it floats easily in the water, a free swimmer. The blood displaced from the veins flows just beneath the surface of the animal's skin so that the middle three-fifths of its length is colored bright blood red.

The fifth of the animal that includes its head also changes color, turning iron blue on top and white below. The stern fifth, usually darker than the rest of the animal, turns jet black.

Thus altered and inflated, the worm swims near the shore. Occasionally it will wriggle furiously, turning in a tight little circle no larger in radius than the animal's length.

It is purely a matter of chance whether the male and female reproductive products can find each other among the waves. When they do, an egg-like larva is born. This object floats with the plankton for a while until suddenly it develops segments and weight and becomes a clam worm.

As the tide begins to recede, the worms that have engaged in the breeding begin to feel along the edge of the water for their old homes. Since the tide is higher than usual, many land in rock crevices too high on the shore. There they quickly die.

Five worms, varying in length from three quarters of an inch to three inches found their way back into the particular tidal pool under observation after one such breeding spree. Since the worm is inflated so that it must float, its docking procedure is a ticklish one. In this case, the worms had to be in the right position so that a wave could push them into the pool through an eight-inch opening in the rock wall. They felt blindly up and down the wall, almost bumping into it, rising and falling with the water, until suddenly they hit the right spot and were lifted over the lip into the pool.

Immediately their concern changed from one of gaining entry to one of staying put. Waves were still breaking occasionally into the pool, and the nearly helpless floating worms tried to dive for the bottom. Unable to do this, they variously selected strong bits of seaweed or the jagged edges of empty barnacle shells, extended their jaws and took a firm bite-hold on it, letting the surf tug and pull at their relaxed bodies.

When the waves stopped breaking into the pool, the deflating process began. Drop by drop the blood that suffused their middle sections passed into the large vein along their back. At the rate of a drop every two seconds, the blood traveled in a perfectly visible flow from tail to head where it disappeared back into the animal's blood system. Gradually, they became heavier and sank to the rock floor, drained nearly white and obviously exhausted.

Then there was a slow and painful search for a rock fissure in which to build a new burrow. Finally finding a suitable location, the worms were too tired to commence construction. They laboriously entered their hiding places slowly and head first until the only activity in the pool was traceable to the nine worm occupants who had not been engaged in the frenzy of this particular tide.

The next day, the tired worms were seen to be still pale in color and moving sluggishly, but the following day they were indistinguishable from their brothers and sisters.

It is indeed a mystery how these clam worms, whose "brains" are smaller than the proverbial mustard seed, amounting to little more than a knot of nerve fiber located in the tiny extended area between the two major feelers, can tell: 1.) that there is a high spring tide, the optimum time when a breeding effort will produce results 2.) that other clam worms have the same feeling about this particular tide, and 3.) that the waves will return them to tidal pools if they will only swim along the rock wall of the coast persistently enough.

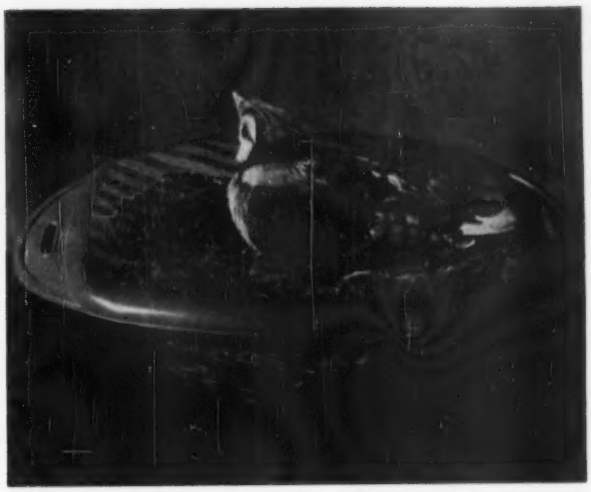
WORLD IN GOLD

The world is turned to gold; to gold and red;
We walk beneath a canopy of gold
So close we almost have to bow our head—
Here is more treasure than we dare to hold.
The eye can take it in, but not the heart—
This should be doled out through the paltry years,
Not lavished so it tears the soul apart,
Making one turn aside to hide his tears.

And yet one golden day may be enough;
The maples lighting all the hills to flame—
The sun reflected in each shining leaf,
Earth captured in a gold and scarlet frame.
Here gold is free to beggar and to thief,
And not to take it is the only crime.

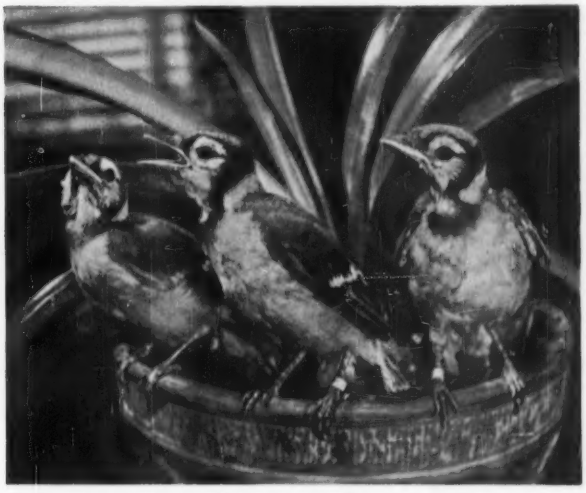
Mae Winkler Goodman

Forced feeding was necessary with one of the three jays, but it soon got the idea and ate as well as the others.



One of the birds wanted to be held in the cup of one's hand but finally settled for a hot water bottle nest.

Two of the birds immediately demanded food and ate lustily of bits of egg, fruit and meal worms and prospered.



Left to right, Jay, Lefty and Tweedy. Lefty, who had to be force fed at first, being the noisiest demanding food.

There was never a dull moment with

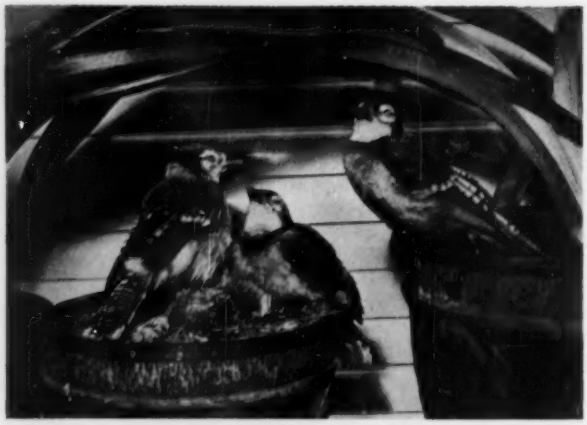
Jays in the House

By JOSEPHINE KERESZTES

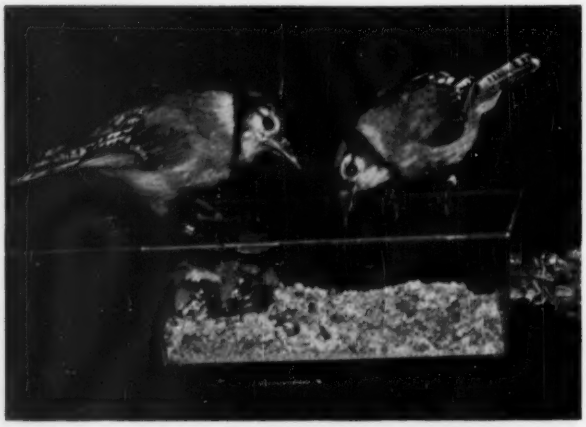
Photographs by Ladislav and Josephine Keresztes

THERE was a great commotion on Perry Avenue, near 205th Street in the Bronx, New York, that eighth day of June. Two bluejays were dive bombing and two children were in tears. Housewives watched from windows. Traffic swirled by in the streets and a cat came on the scene to see what was going on. A dog or two appeared, also.

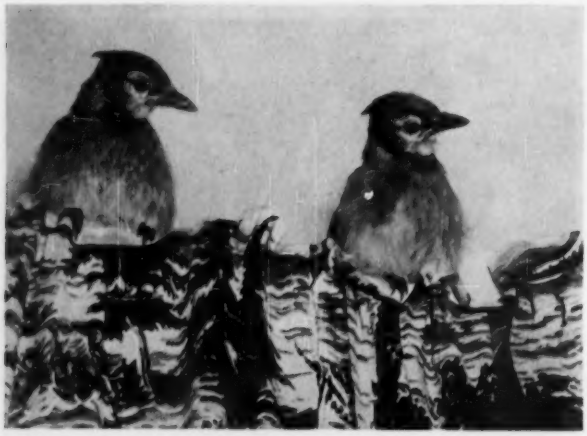
This was no place for three young jays, so with the help of on-lookers and the children, who had been pecked on the head by the frantic parents, the fledglings were gathered up and taken home. There we had a supply of meal worms that were being fed to a baby robin, also other food, and safety. The three were named Lefty, Tweedy and Jay. Their stay with us in a city apartment was full of excitement and interest, as well as satisfaction in seeing them grow. A picture record of their lives in the Bronx was made, and some of the episodes in these lives are shown on these pages.



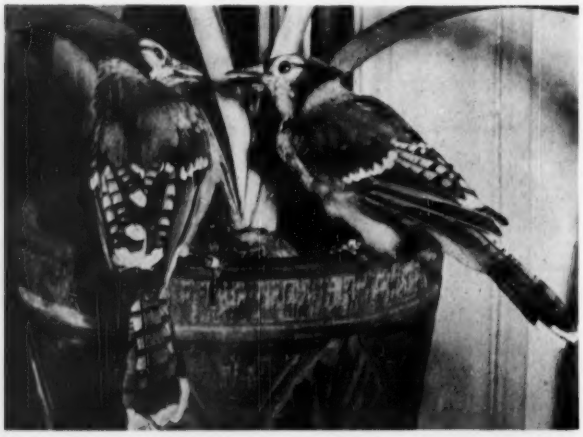
By common consent and agreement the three birds took off time for a siesta, perched companionably together in a pose of sleepy relaxation.



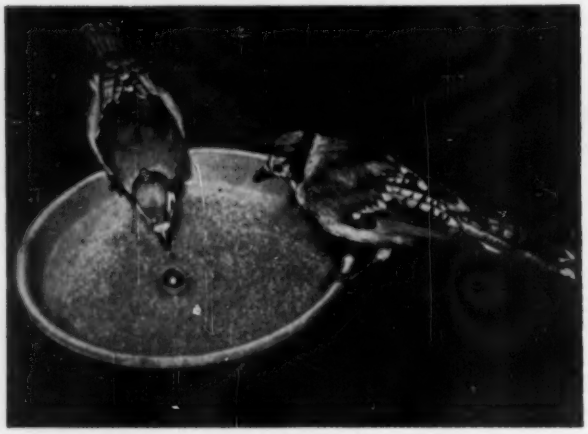
The jays soon learned how to feed themselves from the supply of meal worms in a special feeding box. Sunflower seeds were available for dessert.



After a careful exploration around the apartment the birds found sleeping quarters that pleased them greatly. These were high and safe on the curtain rod.

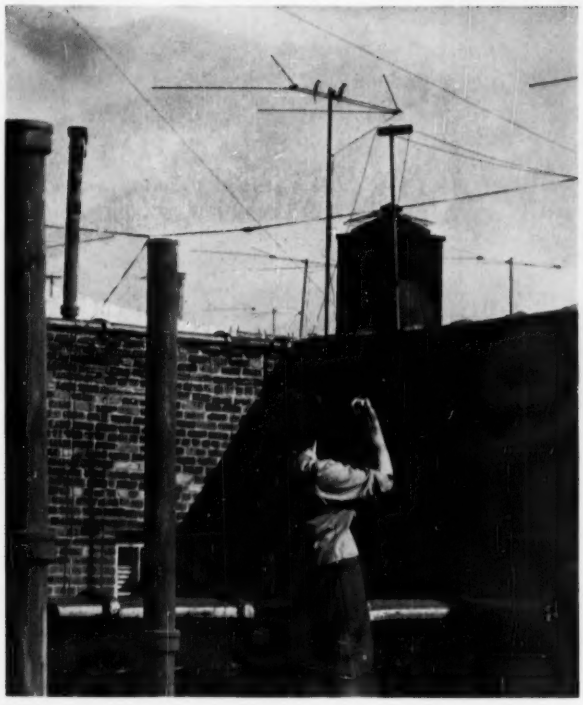


This seems to be a serious and quite animated conversation. One wonders whether Tweedy and Lefty were commenting on the fact that Jay had gone to the hospital.



Lefty, always mischievous, found a Christmas tree ornament and dropped it in the water. Then they took turns pushing the bulb about.

Jay was weaker, easily hurt when the three played games. Finally, on the advice of the SPCA, he was put to sleep, but not without the author shedding tears.



By June 29 the two remaining birds were ready to fly. They survey the world from a perch on a television antenna, and took off with a strange jay.

A few hours after the jays had left both Tweedy and Lefty returned to their home roof and were happy to have a handout from their foster parent.

The author says that this picture should be called "Playtime." The birds adopted the author and were devoted to her, as this picture shows.

Tweedy, the author's favorite, gives a farewell kiss, while Lefty perches on her head. Tweedy returned often, and still returns to the apartment.

"The mist road, the tryst road. . ."

SIDE ROADS I LOVE

The mist road, the tryst road,
That winds atop a ridge,
Or the rutted trail in a flower-strewn dale,
Through a creek that needs no bridge.

The high road, the sky road,
Among the mountain peaks,
Or the sand dune trail through the seaside swale
Where the voice of the ocean speaks.

"The high road, the sky road. . ."

"The rutted trail in a flower-strewn dale. . ."

"The sand dune trail through the seaside swale. . ."

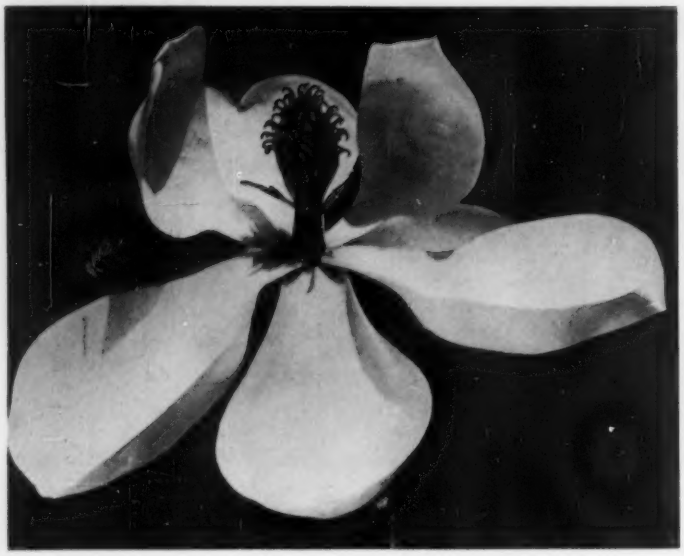
By ALBERT H. HINDMAN

The wood trail, the good trail,
Through stately forest aisles,
With never a word, just the song of a bird
To charm its enchanted miles.

The rim trail, the dim trail,
That skirts the lake's high shore,
The ghostly trace of a vanished race
Who roamed there in days of yore.

"The wood trail, the good trail. . ."

"The rim trail, the dim trail. . ."

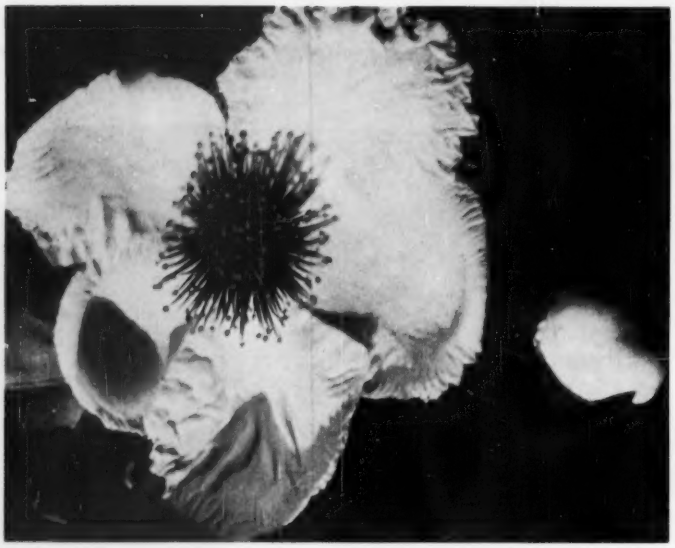


The Live-Forever Flower
(Magnolia grandifolia)

Immediately after the marriage ceremony in the wigwam of her father, an Indian bride and her brave set out to the village of his people. One dark night they were attacked by wild beasts, and before the young brave could fit an arrow into his bow, his bride was cruelly slain. In anguish he gently lifted her broken body and carried it to a low, green valley beside a great river, and there he buried his bride. Grief-stricken, he laid upon her grave and wept. When winter came he built fires near her grave to keep her body warm. As the lengthening days of spring quickened the green things into renewed life he noticed a bit of green pushing upward through the earth of the grave. It grew and spread its large, waxy, green leaves. Then one warm day in May he saw a great white blossom unfold before his eyes. It was then he knew his bride would be with him forever in the Live-Forever Flower. It was the southern Magnolia. (A Choctaw legend.)

The Starlight Flower
(Stewartia malachodendron)

One starlight night an Indian brave was crossing a rocky mountain stream on his way home from a hunt. He carried his kill upon his shoulder, and, as was the custom, in his free hand he carried a gourd of cornmeal. While crossing the stream he slipped and fell, hitting his head upon a stone. The fall was fatal, and as his soul was wafted skyward it carried the broken gourd, partially filled with cornmeal, scattering its contents upon the bushes. Where the white particles of cornmeal touched a twig a beautiful white blossom burst forth, and in the center of each blossom were many stamens with purple filaments like so many gold-tipped purple arrows, and the Indians called it the Starlight Flower. As the gourd sped across the heavens, it left a path flecked with hundreds of glittering white stars, the path of the Indian brave. White men call it the Milky Way. The flower they call the Silky Camellia. (A Cherokee legend.)



Indian Wildflower Legends

By M. H. BERRY

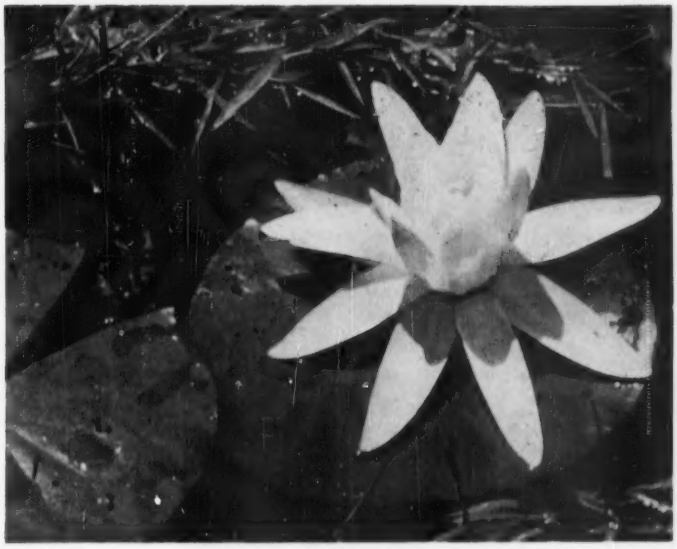
Photographs by the author

When spring came to the highlands of eastern North America, before the time of Columbus, the Indians welcomed the warm southern zephyrs that kissed the bursting buds of the woodlands. In the lengthening shadows of the long twilight they lolled about the campfire to keep out the chill. It was then that all eyes were turned to the Old One, who entertained the gathering with stories steeped in traditions of the Indians, lore as old as the tribe itself. As darkness crept in, the firelight cast ghost-like shadows against tree branches bearing the first green tint of the season. Out of the darkness came the first strident cadence of amphibian voices reveling in the march of the sun to the center of the heavens. These harbingers of spring quickened the mind of the story-teller, and legends concerning the wild things bearing the green symbol of the season became the major topic of the evening. Some of these lovely legends of the Cherokees, Creeks, Seminoles, Oneidas and Choctaws, and pictures of the flowers about which they were woven, are given here.

The Sleeping-Maiden Flower ⟶

(*Castalia minor*)

A young chief fell in love with a beautiful Indian maiden of his own tribe, but her parents had promised her to another brave. Feeling that she should follow the wishes of her parents rather than her own desire, she avoided the young chief. One day he followed her across a lake. As he advanced toward her with open arms she leaped into the water to her death. The young chief searched the water in vain for her body and with a heavy heart he returned to his village. Next morning a hunting party came to the village and told them of beautiful flowers growing in the lake where the unhappy maiden had drowned. The villagers hurried to the spot and saw the water covered with white flowers, strangely beautiful and scenting the air with a delightful fragrance. The village prophet explained the presence of the water lilies: "Each flower is our lovely maiden changed to this form of life. She now sleeps upon the surface of the water forever and we will call it the Sleeping-Maiden Flower." (An Oneida legend.)



⟵ The Foam Flower

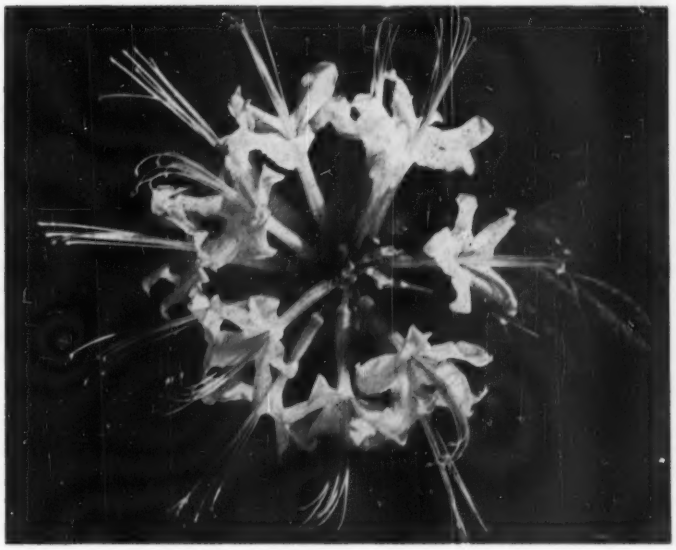
(*Kalmia latifolia*)

An Indian chief, so successful as a hunter, decided the entire hunting ground should be reserved for his own people. To accomplish his purpose he and his hunters destroyed most of the animals. Neighboring tribesmen, not so skillful, were soon faced with famine. The Great Spirit was displeased and brought in the northwind. The mountain streams were stilled by the ice, and snow covered the forest. The remaining deer and bear fled and famine spread to the tribe of the Indian chief. Realizing he had angered the Great Spirit, he promised to share the hunting ground with his neighbors if the southwind were returned to the land. The southwind returned, but only after the chief had been punished by death. As the ice and snow melted, streams of water plunged to the valleys, foam splashed upon the shrubs along the bank, turning into clusters of beautiful, pink-tinted blossoms. Indians called it the Foam Flower. We call it Mountain Laurel. (A Cherokee legend.)

The Sky-Paint Flower ⟶

(*Azalea nudiflora*)

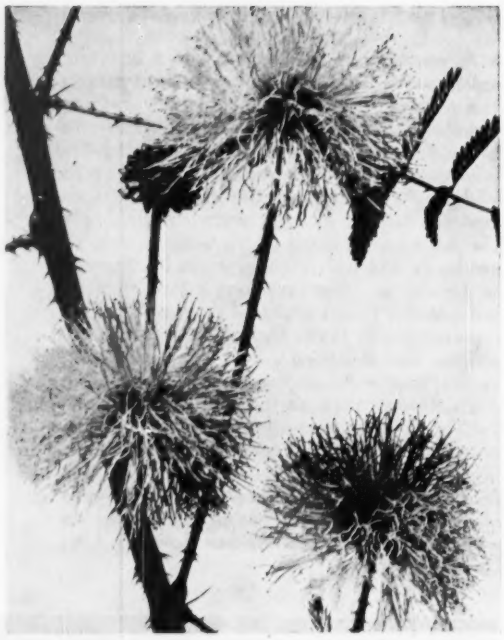
Because he had cut off the rabbit's tail to make a paint brush, the earth animals declared war upon the sky-painter. Unaware of what the earth animals were doing, the sky-painter was busy painting the first pink spray of dawn. Suddenly a volley of six earth-made arrows found its mark in the pink sky-paint. As the sky-painter hurled the six arrows earthward other volleys came. Each volley of six arrows he threw to the earth, and as the pink-smeared arrows fell earthward they landed upon a bush and the paint spread into a beautiful flower with the delicate blush of dawn upon its petals. The six arrows formed the curved pistil and stamens of the Sky-Paint Flower, or Mountain Azalea. (A Cherokee legend.)



The Sun And Moon Flower

(Rhododendron maximum)

When the Great Spirit drove the men people from the Indian's version of the Garden of Eden, the sun and moon hid a beautiful Indian maiden in the far reaches of the mountains, enabling her to escape the wrath brought upon her people. However, the Great Spirit found her and transformed the Indian maiden into a stick. The moon pitied her and wept in anguish. The moon's tears fell upon the stick and became a cluster of beautiful flowers. The sun gave the blossoms a handful of sun-dust, which formed a splash of yellow spots upon one petal in each flower. The morning star contributed large evergreen leaves to complete the Sun and Moon Flower, or the Great Rhododendron. (A Cherokee legend.)



The Bird-Claw Plant

(Mimosa pudica)

The drink of immortality was hidden in the dark recesses of a cave near the top of a high mountain and was guarded by four demons. One sip of the precious beverage would give everlasting life. The Indians knew of the drink and planned to take it from the demons, but before they could put their plan into effect, a falcon captured the prize. While flying away with the loot the falcon was wounded by an arrow from a bow of a demon. The missile cut off a claw and dislodged a feather. Both fell to earth and took root and became the bird-claw plants with hooked spines like the claw of a bird. White men named the plant Mimosa because of its sensitive leaves. (A Creek and Seminole legend.)

The Shooting-Star

(Dodecatheon media)

"If I pluck a star from the heavens, will you have me then?" said a young brave to a lovely young maiden. The astonished maiden, feeling secure in her promise, answered in the affirmative. Word reached the neighboring tribes that the young brave would shoot a star from the heavens, and a tremendous crowd assembled to witness the attempt and perhaps to jeer at the young man's rashness. The hour came one moonlight night. Slowly and carefully he aimed and released the arrow which sped into the sky. The Great Spirit was watching, too, and seeing what a mortal dared to do, He was angered. A dark cloud passed over the face of the moon. Clearly out in space a star was rocketed from its place in the sky and fell to the earth leaving a trail of flaming, blue-white light. It came to earth where the young brave stood. When the cloud passed the moon the eerie, silvery light revealed that the foolhardy brave was gone, and on the spot where he had stood, was a tiny flower, the Shooting-Star. (A Cherokee legend.)

We Visit the Parks

An Editorial

RECENTLY some alarming stories have been written about conditions in our National Parks. These great areas have been pictured as deteriorating for lack of adequate funds for upkeep, or because of staffs insufficient to cope with the vastly increased number of visitors. Indeed, a most dismal picture has been painted of the state of our common heritage in the National Park System.

This summer we were able to visit Glacier, Yellowstone, Grand Teton, Crater Lake, Yosemite, Grand Canyon and Rocky Mountain National Parks. We were prepared for the worst. By and large, we failed to find it. Not that there are not many serious problems, but, taking the areas we visited as a good cross-section, we felt that the National Park Service is doing an amazing job in the face of odds.

It was our impression that some of the "prophets of doom" have failed to differentiate between that part of the parks for which the Service is responsible, and that part which is the responsibility of the concessioners. It is a fact that the hotels, lodges, and other facilities are, to a large degree, antiquated and inadequate today. Faced with high replacement costs and short seasons, concessioners understandably prefer to make do with what they have. So prices are generally high compared to what the traveler gets for his dollar elsewhere. For example, we stopped at twenty-six different motels of the best quality, and in only one instance did we pay as much as we paid for comparable but much less well-appointed facilities in the parks.

Not that we believe that Park visitors should expect deluxe accomodations at modest prices—or even deluxe accomodations at any price. In our opinion luxury hotels, with golf courses and other appurtenant facilities of resort areas, do not belong within the boundaries of our National Parks. And it is not beyond reason, consistent with such a view of the parks, that, perhaps, the antiquity of so many of the facilities is a blessing. In many cases it may be much easier, when these structures finally become unusable, to replace them by facilities *outside* the Park and let Nature take over as she should *within* the area.

Yosemite is a good case in point. It provides ample material for criticism of the condition of the Parks. There is no future for Yosemite Valley unless the congestion is relieved. It is today a great public campground, mostly for Californians, and a massive automobile parking lot. We do not believe that this is the highest use for one of the most spectacular spots in our country.

Rocky Mountain National Park, on the other hand, although plagued by many troublesome inholdings, has motels and other good accomodations outside the Park and in Estes Park. Great Smoky Mountains National Park, in the East, has a similar situation, with ample accomodations outside the Park in Gatlinburg.

However, the progressive deterioration of accomodations in the Parks may well jibe with the National Park Service's "Mission 66," a project that comprises a thorough study of the Park system to the end that it may meet the demands of public use without sacrifice of the original purpose for which the system was created. Development of accomodations outside park boundaries is an important part of this study.

For the most part we found the roads within the Parks quite good. Going-to-the-Sun Highway, going down from Logan Pass on the west, is in woeful shape, but we understand that funds are this year available to put a water-resistant surface on this spectacular highway. Yellowstone and Grand Teton Parks both could use a share of the forty percent increase in appropriation, mostly for roads, voted the Service at the recent session of Congress.

One should not, of course, consider the Parks only with regard to those parts visited by the greatest numbers of people. Every park has extensive areas to which visitors seeking the relaxation of the wilderness can escape by trail. It seemed to us that more emphasis should be placed on this fact; that there could well be more "promotion" of trail trips into the back country, on horseback or on foot, to the end that more people would be encouraged to achieve a more intimate acquaintance with the area. This should be both a Service policy and the responsibility of outdoor organizations. Also certain simple camping facilities in the back country would have to be provided because pack trips are expensive. We hope this will be given thought in carrying out "Mission 66."

We came home with the feeling that the naturalist service in the parks is often a stepchild. We found great visitor interest in the interpretation that is today available, but the interpreters are frequently forced to work with tools harking back to the stereoptican days. Projectors that will provide the naturalists with the means to show motion pictures in color and sound are typical of modern tools that are needed.

One cannot return from a visit to the National Parks without a renewed appreciation of the men and women who wear the green uniforms of the Service. They are dedicated people, finding full-time or part-time careers in preserving, administering and interpreting some of the most marvelous areas in the world. We repeat that we think that they have done a splendid job against odds, and we hope that they will be better and better implemented to do a still finer job.

A heritage of natural wealth is protected by

Ontario's Authorities

The Elora Gorge, north of Guelph, Ontario, is a fairly extensive area of great natural beauty. It was purchased by the Grand Valley Conservation Authority and made public park.

A CONSERVATION program to save the face—and a considerable part of the economy—of a whole country-side is a difficult, involved affair. To conduct such a program and still retain for the inhabitant of that countryside the realization that it is his individual concern that is involved, that he in fact is directing his own salvation, is conservation in its fullest sense. Ontario has such a program.

For decades the people of that Canadian province had seen almost annual floods sweep down from the deforested hills and watersheds. Farmers had watched their best soil carried along with these waters. In the burgeoning cities, those who cared found that the natural scenic and recreational sites were being engulfed by industrial and residential expansion, leaving only the streets and cement playgrounds in which their children could grow.

Worst of all, those who did not even care seemed to be developing into a majority. In such a situation, a comprehensive and well-backed conservation undertaking was the only solution, but to force a peremptory, government-promoted scheme on private citizens and landowners imbued with traditional Canadian individuality would have been to handicap it severely.

From this realization the River Valley Authority program was devised. Started in 1946, it now includes nineteen such Authorities, embracing a total of 287 municipalities and 11,976 square miles. In flood control projects alone it has already spent or has at construction stage more than $20,000,000 worth of projects, and has undertaken survey work on others the estimated cost of which will exceed thirty million more dollars.

By no means limited to the flood control phase of conservation, the program has provided extensive reforestation, cleared streams, helped eliminate soil erosion, and, by the example of doing, has planted the vital seed of love for heritage, and land itself, in the minds of thousands of school children and adults.

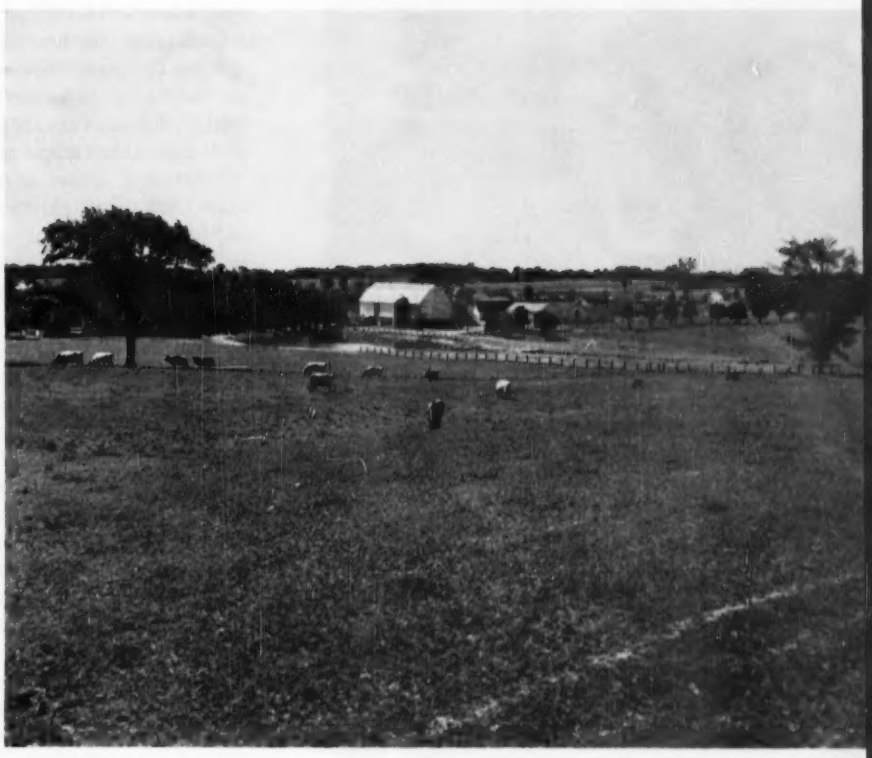
About 20,000 or 30,000 years ago the great ice sheets and glacier lobes receded from the limestone and shale plain that is now southern Ontario. Through its grinding and portage and pushing, the ice formed the rich till plains and the parallel hills and ridges that characterize this fertile area.

However, Ontario has an average annual rainfall of thirty-two inches. As long as these hills and watershed slopes were forested and covered with absorbent humus that could hold this rainfall, releasing it slowly and gradually into the ever-flowing streams, erosion and large floods were minor.

About 1800 came the great influx of people and the accompanying demands upon timber. Until 1826 wood

By FRANK A. TINKER

Photographs from the Ontario Department of Planning



The Authorities throughout Canada's Ontario Province are given a subsidy for construction of farm ponds. This one was built under this plan by the Don Valley Conservation Authority.

growth on public lands was owned as a preserve by the Royal Navy, from which masting, naval stores, and other products were drawn as needed. Shortly after this protection was removed came the industrial revolution's cry for rails, firewood, and building. Steamboats plying between Toronto and Montreal used from fifty to sixty cords of wood to power each trip. The cedar disappeared into posts, and in 1890 the larch saw-fly all but eliminated the large stands of tamarack. Woodworking for furniture and other products took the hickory, ash, and rock elm. The syrup from maples, which had, until the middle of the 19th century, formed a large part of the sugar supply, was now supplanted by imports. The groves began to disappear into the potash furnaces. Sixty large maple trees produced one 650-pound barrel of potash. Tanbark and hemlock went for other industrial uses, and, of course, the fires that accompanied the further settlement of the province were indiscriminate and costly.

With the disappearance of the forest cover, the glacial depressions became gullies and overflowing seasonal water traps. These systems of watercourses and actual rivers, it was found, were the natural conservation units. The welfare of their every part was linked with the rest. The distances encompassed were not so large that administration would be made difficult or that terrain features would vary too widely. For that reason, the watershed was chosen as a target unit, rather than any artificial division, such as a county or township.

Under the Conservation Authorities Act of 1946, municipalities situated along these watersheds were empowered to organize themselves into Authorities, which were given the status of bodies corporate. From that position they could call upon the provincial government for assistance with their conservation problems.

Most significant, the first step and the continuing initiative rests with these municipalities and their Advisory Boards. The Boards themselves are made up of farmers, municipal authorities, teachers, or other interested persons who have a real stake in the community's conservation. Two such municipalities in the watershed must petition the Ontario government by resolution and establish to its satisfaction the genuine concern of their populace for the continued welfare of natural resources and beauty in their valley system.

Representatives from all the municipalities may participate in such petitioning and eventually, of course, all of those concerned are advised and consulted on the course of action to be followed. When finally approved, the Authority is established by an Order in Council of the provincial government.

Once established, the Authority cannot be expected to

This barn, built in 1809 was bought by the Humber Valley Conservation Authority for restoration as a museum of pioneer farm implements.

A self-explanatory sign, and (below) junior high students take part in a tree-planting "bee" under the auspices of the Ausable River Conservation Authority.

have facilities immediately available for undertaking the projects necessary. Indeed, in most cases it is not clearly known exactly what might be needed in this regard. For this reason, the Ontario Department of Planning and Development conducts whatever surveys are requested, or needed, on which to base a sound and thorough conservation activity. Utilizing professional help and, in many cases, the services of University or engineering students, such surveys are compiled from historical records, field work, and whatever other sources are available.

Invariably, the first step is that of aerial photography, from which mosaics and contour maps are made. Then data are collected on the use of woodlots, extent of reforestation attempted or needed, degree of stream pollution, wildlife depreciation, and the thousand other aspects of land use and misuse.

From this report a multitude of recommendations can be drawn, all thoroughly practical and containing a balanced view of the *total* intent of conservation. No indiscriminate dam-building projects are undertaken the value of which in irrigation or flood control would be outweighed by their other, different effects upon the community. For instance, in the Ganaraska watershed, almost a third of the 60,000 acres involved were recommended for reforestation as a water storage measure. In other areas, with soil better adapted to intensive farming, the programs recommended concerned themselves mostly with soil erosion, the construction of farm ponds, strip-cropping and crop rotation, and the reduction of grazing in woodlots. In the Don River Valley, which flows through the environs of metropolitan Toronto, beautification, use for recreational and educational purposes, and stream pollution demanded the most attention.

Once the recommendations of the Planning and Development surveyors have been sifted, those portions which are accepted for actual adoption by the Advisory Boards of the municipalities are taken to the appropriate Ontario agency for financial assistance and advice. For instance, the reforestation requirements are obtained from the Department of Lands and Forests, advice on soil use from the Department of Agriculture, and so on. The administration, initiative, and overall decisions to be made in connection with any of these programs, however, is retained by those persons most vitally concerned—the inhabitants of the watershed speaking through their Authority.

Cost of the various projects undertaken is usually divided between the Authority, the provincial government, and in some cases the government of Canada, depending on the nature of the work. On several flood-control measures, for instance, the Authority is contributing 25 percent of the cost, the Ontario government the remainder, whereas in the case of a conservation project such as the Luther Marsh Dam, which already has provided outstanding duck breeding and migrational waters, the Canadian government is contributing 37½ percent, the Ontario government a like amount, and the Grand River Authority 25 percent.

The various Authorities, however, raise funds for their own uses as a corporate entity, one of the most significant being the purchase of lands to be set aside permanently as reforested areas in trust as water storage and recreational grounds. Some of the cut-over sandy areas now owned privately, or which have reverted to public lands, are acquired through these funds and become the property of the Authority.

On the other hand, the Authority by its very nature can

undertake only those large projects that do not encroach upon private land ownership or usage. The improvement in land use on the individual farms, grass stripping, ponds, or a total shift in emphasis on the type of farming to be employed, is left entirely to the owner. He has, of course, access to the Zone Forester and the Farm Planning Service of the Department of Agriculture for advice on farming or conservation. Through the services provided in the Authority he can obtain any other information along this line he may need, usually in connection with integrating his own land into the general scheme of the valley plan. Actual tree plantings can be obtained through his Authority, for instance.

In addition to the actual work done thus far toward rebuilding Ontario and steering a safe course for its land in the future, the public education accomplished, both deliberately and incidentally, is inestimable in value. By showing the practical results and consequences of conservation, by including those things understandable to the city dweller as well as the farmer in the liberal use of the term, a cogent message has been given to more persons than through any other possible educational device that might have relied solely upon words for its argument.

In the Don River Valley, a Conservation Trail has been established to demonstrate the need for and meaning of the Authority's program. Winding through the valley as it skirts this region of almost a million and a half residents, it has 24 "stations" along its course. At these vantage points, particular facets of the Don Valley Authority's program, conservation in general, or the area's history are in evidence and are discussed in booklets distributed to help make this tour meaningful.

At the beginning of the trail, students and visitors may see the little Don River as it emerges into Lake Ontario, muddy and polluted from industrial and residential wastes, and the measures now being undertaken to correct this are explained. The road trail leads up the stream to the park areas, both planned and completed. There the tour, which may be a school class or a civic organization, learns from the guide the facts about parks, and how they may be actually the most economic use for land of low agricultural productivity in regions of high population pressure. Eventually, under the impetus of this philosophy, Toronto is to have a "green belt" of such recreational centers stretching across its entire width.

At the same site may be the proposed dam backwater area, designed to provide some measure of flood control as well as a recreational lake. No one in greater Toronto lives more than twelve miles from the Don, so that any such construction has real meaning for its citizens.

To give the average person making the tour a better appreciation of the history of this area, which is so frequently obscured by a city's indiscriminate sprawl, the old shores of prehistoric Lake Iroquois are traced out. The glacial advance and recession is clearly seen here, and the saving of its deposits of till soil becomes for him a matter of practical importance rather than an argument about dead matter lying somewhere beneath the city's gray pavement.

Farther up the trail he may see examples of unprotected slopes, which even at present are losing annually some fifty tons of topsoil per acre to the insidious creep of erosion. Well-planned farms nearby illustrate the methods for alleviating this loss.

Beyond the farms, farther north, are the woodlots, where the meaning of cutting by-laws, forest grazing, (*continued on page 444*)

A group of boys learning the species of trees at a stop on the trail maintained by the Don Valley Conservation Authority

Town of Brampton during flood of 1948, and (below) the flood control diversion channel built by the Etobicoke-Mimico Conservation Authority.

Paul Bartsch talks to members of the District of Columbia Audubon Society on the history and natural history of Lebanon, his Virginia home that attracted more than fifteen hundred outdoor lovers last year.

By RICHARD S. BLOCH

PAUL BARTSCH and Lebanon

Dr. Bartsch and his black-headed cacique from the upper Amazon. This bird, and another parrot, live in the warm surroundings of the garage, with an occasional stroll across the lawns of Lebanon.

THE HOME of Paul Bartsch, world renowned naturalist and authority on mollusks, is a friendly place. As I drove up the long road that winds through his beloved "Lebanon," the tall cedars on either side seemed to extend a welcome.

When the car approached the house, a historic structure built four years before Mount Vernon in colonial Virginia of 1732, a shaggy dog, wagging his tail, ran to greet me. A guinea hen scampered from the bushes, a flock of birds twittered in a nearby tree.

Dr. Bartsch invited me into his study where we could talk while watching the nuthatches, chickadees and purple finches enjoying their lunch of sunflower seeds on the window feeding tray. Looking out over the expanse of woodland, we could see the waters of Pohick Bay.

"Here we have 458 acres of natural beauty, only twenty-two miles from the capital," he said, "filled with the wonder of life. Mrs. Bartsch and I are in love with this place and we wish to share our pleasures."

The telephone rang. A Girl Scout troop wanted to visit Lebanon. Dr. Bartsch looked at the appointment book and set the date. "Scarcely a day passes without someone coming out here," he said to me. "Either it's Scout troops, garden clubs, school classes or just individuals interested in Nature. Fifteen hundred people came last year." Dr. Bartsch uses every opportunity to spread his philosophy. "I teach them all to respect the growing things and to love the out-of-doors. It's a shame in this day and age to see so many folks racing over the highways, eyes glued to the speedometers, ignoring the

beauties of Nature. Those who are attracted by the flowers and animals often thoughtlessly destroy them. Lebanon is one place where everything that creeps and crawls is protected." This was not always true, however. Dr. Bartsch explained that when he acquired the land in 1942 hunters were shooting ducks from blinds along the shore.

"Come let me show you around." We walked down a path, lined with laurel and azalea shrubs, to Fern Valley. There, Dr. Bartsch pointed out native orchids, rhododendrons, trumpet vines, pitcher plants, blue mountain hepaticas, lady's slippers, adder's tongue, and numerous species of ferns. "Many of the ferns and wildflowers you see were collected by Mrs. Bartsch and I on our annual auto cruises to Nova Scotia, the northern mountains or the deep South. We now have all but one of the ferns growing east of the Mississippi."

To Dr. Bartsch, the principles of ecology are not just abstract.

"These plants are happy here," he said. "Even that chap over there that a friend brought from England," he added whimsically, pointing to a hart's-tongue fern. "We try to be helpful to the growing things. If a plant requires acid soil, we provide it. That wall over there is made of rocks that we brought back from the Shenandoah Valley. They consist of limestone deposits that create an alkaline condition necessary for many orchids and ferns. We made the swampy land, the dams and the pools. Everything looks natural and that's the way we want it—as though we hadn't done a thing."

Overhead an eagle circled a huge tree. "We have at least 205 species of birds here," he said, "and new ones are being discovered all the time." An event last year thrilled the Bartsch's, as well as thousands of other Nature lovers. It was the appearance in Lebanon of the rare song bird, Bachman's warbler. So many people crowded into the sanctuary that Dr. Bartsch had to close off the area where the bird was seen. He established special guided trips for those who wished to catch a glimpse of the male warbler and to hear its unusual singing. Despite the booming of Fort Belvoir guns across the Bay and the zooming of planes, the bird's song was later recorded on tape. After spending a little more than three weeks in Lebanon it departed and has not been seen there since.

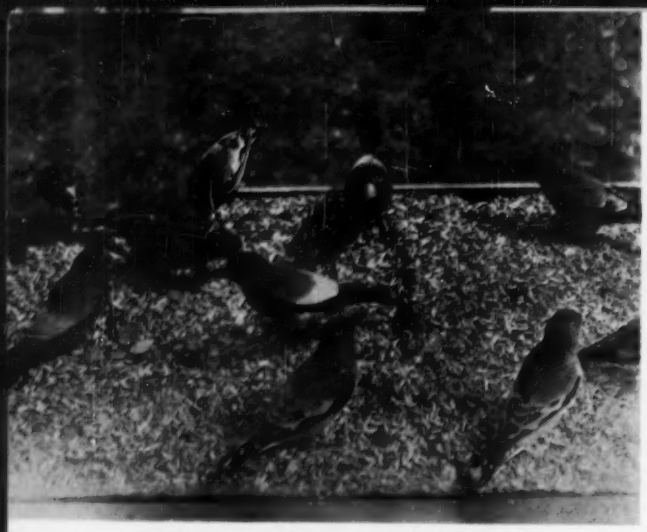
I left Dr. Bartsch in his study and took the long walk down to the Bay. On the trail I saw the block of salt set upon a stake for the deer that roamed the woods. With an alert eye I hoped to catch a glimpse of the foxes, squirrels, skunks, opossums, raccoons, otters and other animals that live within the sanctuary. At the water I watched the gulls and ducks from behind an abandoned automobile placed there as a blind for observing wildlife.

Upon returning, I found the naturalist examining the more than 500 cards representing the titles of his published works. "In all my life," he said, "I've never been bored or weary. The only thing I've ever wanted is a forty-eight-hour day. I often have thought of myself as crossing a stream on stepping stones with the water rising behind me after each step." Dr. Bartsch, now in his 84th year, feels more than ever the pressure of time. "I hope that I will be able to finish my biography," he said.

Dr. Bartsch's biography, when it is completed, will be voluminous, for his life as a teacher, explorer, classifier and writer has been so rich and many-faceted. He recalled his early days in Germany. His father, a lifelong naturalist, sparked young Paul's interest in the out-of-doors. He gave his son many pets to play with, a sand pile filled with shells and a microscope to see the wonders in a drop of water. When the Bartschs moved to America, Paul, delighted with his new surroundings, set about to study native birds and collected a total of 1500 specimens, which are still perfectly preserved today. His interest in the flora and fauna of the Iowa area where he lived was nurtured by his teachers during his high school years and blossomed during college days into a consuming desire to learn more about all the natural sciences.

From Iowa and the State University he came to Washington, D.C., and the National Museum, where a new chapter in his life began. He focused more of his attention

Pink lady's slipper is one of the wild plants found in "Fern Valley" at Lebanon. There the Bartschs have acclimatized a wide variety of wild flowers and ferns.



Evening grosbeaks lunch on sunflower seed on the window feeding tray at Lebanon. Many other kinds of birds are residents or visitors there.

A resurrection fern grows on a log at Dr. Paul Bartsch's Lebanon.

to the study of mollusks, a most important group viewed from an economic and geological standpoint, but his interest in birds, flowers, mammals and other phases of Nature never ceased. He taught histology at the medical school of Howard University and was professor of zoology at George Washington University. He held office in many civic and scientific organizations and, like a true teacher, inspired all those with whom he came in contact. "My lab trips," he said, speaking of his days with the Bartsch Botanical Club and the Microscopical Society, "opened many eyes to the wonders of the out-of-doors."

The former group was organized by a patent attourney as a class in biology for the young people of Washington. Dr. Bartsch soon emerged as the guiding spirit, and his name became permanently associated with the gatherings.

With an ever-probing mind, he adapted the arc lamp for use in projecting microscopic life upon a screen. He illustrated his first lecture for the Microscopical Society by his method and so astounded the members that they elected him president of the group.

He devised an underwater camera, a submarine light, a poison gas detector, and a way to protect wooden vessels from ship worms of the deep.

Dr. Bartsch took from his desk a small aluminum band bearing the inscription, "Return to the Smithsonian Institution" and the date, 1902. "I placed these on the feet of some black-crowned herons I was studying in those days," he said, "and was able to learn many things about their life span, migration and nesting habits not known at this time." From this early experiment in bird banding, which developed from an idea of Audubon's in 1806, came a popular practice now extensively pursued by the United States Fish and Wildlife Service.

"The *Who's Who* summary of his career briefly mentions that he furnished a poison gas detector," wrote Alma Chesnut in *Nature Magazine* for November, 1930. "Few would guess that the 'detector' was a species of land mollusk familiar to everyone—the ordinary, garden slug that causes chills to run up and down sensitive spines. Dr. Bartsch generously divides honors for the discovery of his gas detector with a pet parrakeet.

" 'I was raising the slugs in a glass cage,' he says, 'and the parrakeet dropped an apple on it so that they escaped and got all over the house. In gathering them up I noticed that they seemed very sensitive to odors and began to experiment with them. They showed their dislike for mustard gas by pulling in their little tentacles when one part of the gas was diffused in twelve million parts of air. The gas is not dangerous to man until it has reached a concentration of one to four million parts. When this was attained they would roll all over themselves and close their breathing pores.'

"Garden slugs, then, were responsible for saving thousands of lives during World War I. They are native to Europe and all a soldier had to do to secure a detector was grub around a bit in the rubbish behind the trenches. The slugs were kept in little cages with a wet sponge and since they were able to stop breathing in emergencies, they served for indefinite periods. Some were gassed as many as twenty times without sustaining injury. When the observer saw them roll over and over in convulsions and exude a creamy liquid, he quickly gave alarm and gas masks were donned."

During World War II a dangerous enemy of man, shistosoma, never got a chance to infect our soldiers in the Philippines. It was Dr. Bartsch who warned the military of the presence of this parasite, which spends part of its life history in water snails.

Dr. Bartsch broke the mystery of the Cerion, a mollusk found in the Bahamas and the Florida Keys. These island shells seemed to change their characteristics from one generation to the next. Most biologists believed this was due to changing environment, but Dr. Bartsch proved beyond a doubt, that hy- (*continued on page 439*)

Torch-bearer for Terns

By FRED WACHTMAN

Photographs by Robert Blackstone and the author.

I BEAR a flaming torch, placed in my unwary hand one warm spring day last year. It started during a lazy afternoon walk to Playa Del Rey salt-water flats near Venice, California. Suddenly tiny bits of fleecy white clouds seemed to drop out of the sky overhead and fly swiftly toward me. They threatened to pierce me through with black-tipped needles of gold. When I felt I could safely lower my shield a little, I discovered my assailants to be graceful least terns, easily distinguished from other terns by their yellow bills and feet, white-crescented foreheads and diminutive size.

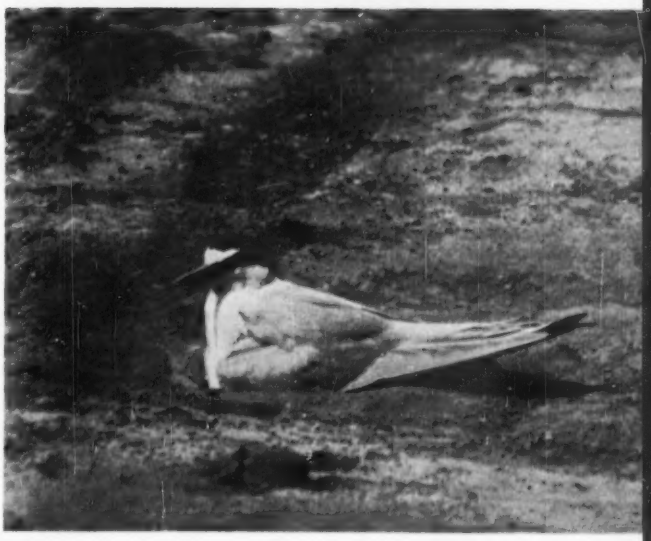
Their action spoke clearly of one fact—nests! I made my way to a large clearing in the marsh-weeds. There the ground was dry and hard, and surfaced with a white salty substance left by the receding water as the marsh was drained. Soon a great flock of terns dove at me. I knew it would mean a cleaning bill to continue braving the bombing raid, but I had to find those nests!

Then I saw one. In a tiny depression on the ground were two marble-sized, brown-blotched eggs. They looked so much like the ground around them that I wondered if I had walked on any while searching. Soon I found more, as many as six nests within a radius of as many feet. In three large adjoining fields, clear of weeds, I estimated more than 200 nests. Most of them contained only two eggs, but I found three nests with three eggs, and two with four. Nearly all of them were in hollows, obviously scratched or pecked out of the ground by the nesting pair, but several were laid in footprints or other shallow depressions. In only two nests were there any twigs or other scant semblance of a lining.

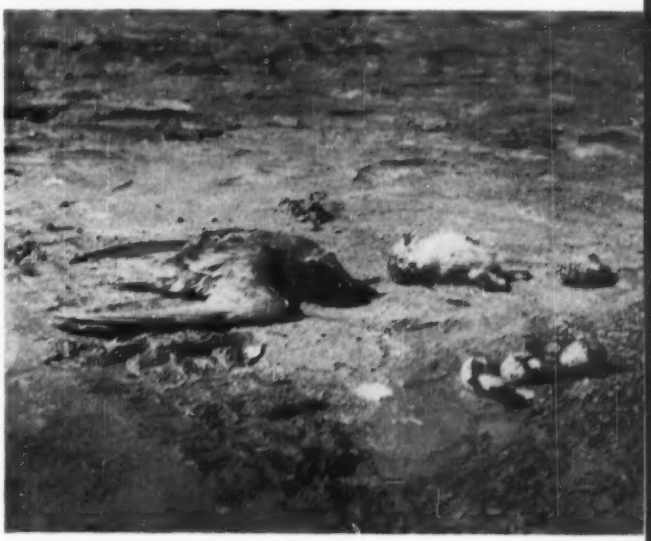
Not all of my observations pleased me, for I began to notice broken eggs. Motorcycle tracks were everywhere. I wondered how many nests had been destroyed before I discovered this community nesting area.

A few days later I stopped three cyclists racing on the grounds. As I pointed out the damage they were inflicting they seemed surprised. They left apologetically, but remarked that many motorcycle enthusiasts regularly used the area for racing.

It was apparent that something must be done im-



The mother tern sits on her sketchy nest on the Playa Del Rey salt-water flats. Below, some of the destruction by motorcyclists—two young birds and one adult killed and three eggs crushed.



Eight tern nests containing eggs are shown in this picture, as well as motor cycle tracks. Two days after the picture was taken all these nests were destroyed.

The author and torch-bearer for the least terns holds one of the baby birds in his hands. These youngsters immediately "played dead" when danger threatened

mediately! That evening I painted two large posters pleading for consideration for the birds. I posted them at the two main entrances to the fields. But the following week-end showed fresh signs of destruction. Earlier in the spring I had sorrowed over a marsh hawk's nest, demolished in the same district by unscrupulous persons. Obviously more drastic measures must be taken or these lovely sea swallows would suffer the same fate.

Phone calls to the leaders of the Los Angeles Audubon Society, and the local office of the U.S. Fish and Wildlife Service, revealed that both Federal and California State laws were involved. I made an appointment with the sheriff. But after taking one of his deputies to view the scene of destruction I was offered little encouragement. He promised to patrol the area occasionally, although he pointed out the difficulty of apprehending offenders in fields inaccessible to prowl cars.

I had taken up the torch. I was determined to protect these rare birds! I learned that a few others were concerned also. For a few summers, E. H. Bowersock, an Audubon member, received permission to act as self-appointed warden for the nesting least terns at Playa Del Ray. But when he moved away no one took up the task.

Investigation revealed that the property is owned by Howard Hughes of Hughes Aircraft Company, which has a landing field about a mile away. On the questionable ground that the birds would interfere with planes, Hughes and some of his top brass had opposed the proposal that a bird sanctuary be established. However, the property has for some time been listed for sale, but the real estate firm handling it indicated that the price would be high if it were used for sanctuary purposes.

Plans are now maturing to make an adjoining area into a small craft harbor to be called Marina Del Rey. This is a joint Los Angeles County and California State project, and originally included making the tern nesting area a refuge. This phase has been abandoned because of cost, or, possibly, because the idea was not sufficiently pushed. If such a status were achieved the sanctuary would be under the Los Angeles County Parks and Recreation office.

Here is a spot said to be one of only three on the Pacific Coast where this species of tern nests. These birds, forced to the verge of extinction a few years ago, are now trying to make a comeback—against great odds. A sanctuary seems the only answer.

In the past the *Evening Outlook* of Santa Monica, had shown much interest in similar crusades. I hesitated to let the nesting place become common knowledge, but went to talk it over with someone at the paper. After agreeing that the situation could hardly be worse, we decided to warn the offenders by a news item. The *Outlook* published a fine article with pictures, which, I believe, helped considerably. Other suggestions were made. Two people living within sight of the salt flats showed much interest and agreed to call the sheriff whenever any trespassers were seen on the nesting site. Then I carefully went over every foot of the area, mapping out the nest locations, and found only twenty-six active nests and five live chicks remaining. I posted another large sign to protect the remnant, warning that cyclists were committing a federal offence, and that people were alerted to notify the sheriff of their presence on the

grounds. I also confided in a man who set up a highway candy stand on nearby Culver Boulevard every weekend. During the weeks that followed he stopped many from entering the area.

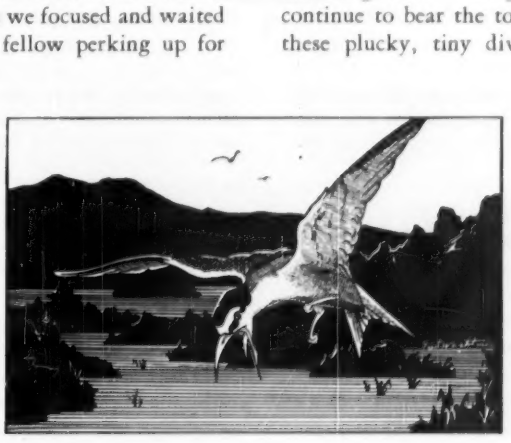
There was never a better opportunity to study the least tern. It amused me to see them "dive-bomb" jack rabbits that unwarily wandered near their nests. But, although the rabbits would not harm them, there was much evidence of predators that would. Dog tracks were everywhere, as well as those of cats, weasels and other animals. I watched the courageous terns rout hawks and turkey vultures. Some birds had been shot by .22 caliber rifles and shot guns. One day a friend of mine chased away two boys who had a .22. I found many empty cartridges and shells lying on the ground, and one metal-tipped arrow.

When I saw my first baby tern I thought it must be dead. Carefully, with a stick, I turned it over on its back. Immediately it kicked its tiny, yellow-webbed feet to turn over again and proceeded to convince me it was assuredly very dead. The little fellow looked so much like the gray and white ground that one could find him only by diligent search. In a few hours after hatching they begin to run around. It seems strange that terns with such weak legs and feet—which they use so little—should do so much running in their infancy. A friend and I, while taking some pictures one evening, caught sight of one chick as it started off across the field in a wavering sprint, but when I started after, it immediately lay down as still as any rock in the vicinity. It remained thus "dead" while we shot it with our camera for a few close up pictures. Then we focused and waited for a snap of the downy little fellow perking up for another sprint. After almost a half-hour of waiting we lost patience and concentrated on other pictures. Another half-hour passed and we looked back to see him in the same place, still just another inanimate lump of clay in the field. How long he remained there after that I do not know.

With a typical naturalist's inquisitive mind, I wondered if some of the parent birds' squeaking sounds were understood by the helpless chicks as a command to "lie low!" One day I watched a tern hatch. At the sound of the parents' alarm, immediately upon emerging from the shell, the scrawny youngster assumed the pose of death by then so familiar to me. This, of course, could have been exhaustion from the strenuous efforts that accomplished his liberation.

In subsequent visits I was able to keep a fair check on the nests I had charted. It always hurt to find a few more destroyed each time. But a few plucky birds showed reluctance to give up. When their nests were destroyed they relocated and laid more eggs. However, they soon realized that it was a losing battle and forsook their nests. To the best of my knowledge not one chick lived to be even a week old! When it came time to migrate south the flock was sadly depleted.

Year after year the terns that nest at Playa Del Rey are frustrated in their efforts. This needless destruction must cease! For these, the daintiest of sea swallows, to hold their own numerically in the fight for survival there must be a new generation this year and every year! Since the terns have not despaired, neither will I. Believing that "one good tern deserves another," I continue to bear the torch of conservation in behalf of these plucky, tiny dive-bombers of Playa Del Rey!



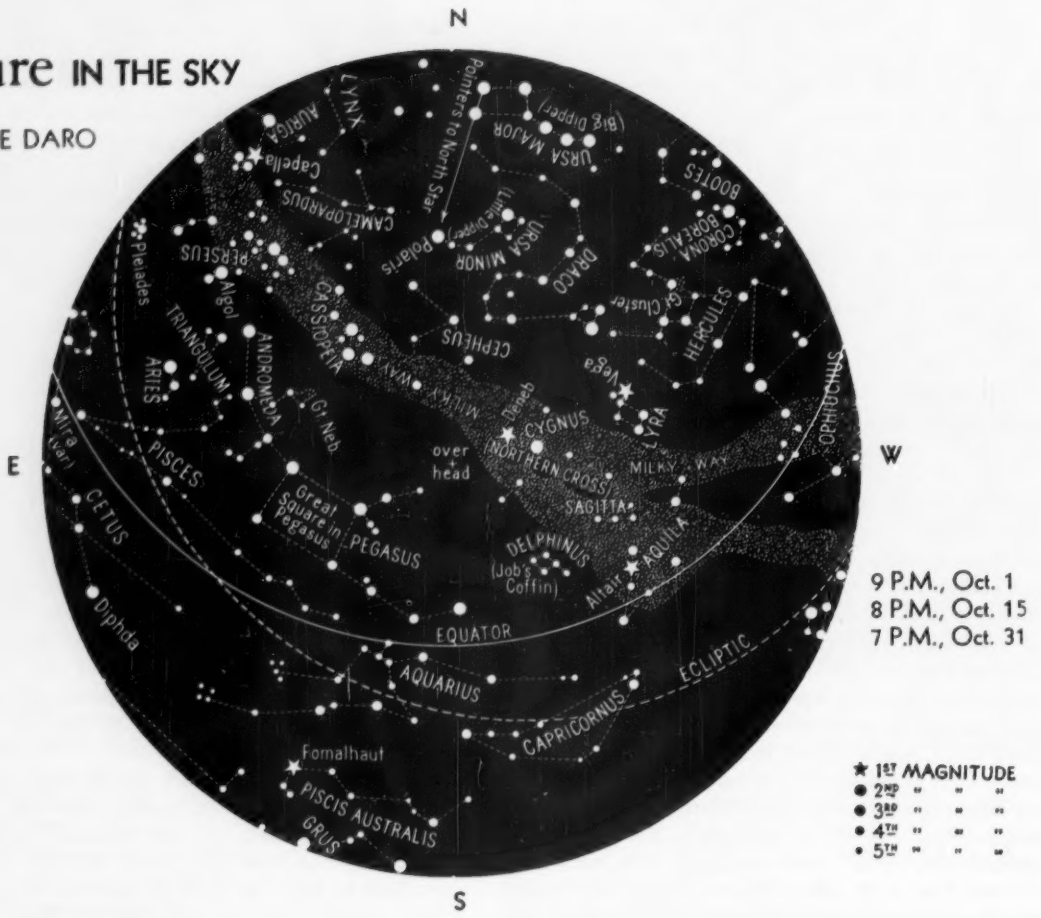
THE GREATER PART

Who has compassion for all gentle things
Within deep wilds, or in the lyric flowing
Of cool, translucent waters where shy wings
Curve down to lave; where some inherent knowing
Alerts the startled deer when danger rings
Who stalks but to observe, not for the showing
Of hunter's prowess, knows the greater part
Of love, a simple, understanding heart.

May Gibson Sherbakoff

Nature IN THE SKY

By SIMONE DARO GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

Artificial Satellite

THE DRAMATIC announcement by the White House on July 29, 1955, that this country will attempt to launch an artificial satellite is a new milestone in man's ever-widening efforts to conquer space. Half a century after the Wright brothers' first powered flight at Kitty Hawk, N. C., the spectacular developments in aviation, jet propulsion and rocket engineering have now made this possible.

Mathematically, this is by no means a new concept. Man-made satellites are subject to the same laws of motion that regulate the course of the planets and other celestial bodies. Kepler's laws of motion, which may be derived directly from Newton's law of gravitation, enable one to compute the general characteristics of the satellite's orbit, once its distance has been selected. Accurate computations are elaborate, but if one wishes only to obtain rough estimates, these computations become simple enough to be followed by anyone with a knowledge of high school mathematics. As an illustration, I have worked out the problem in simple form, using round numbers and assuming circular orbits. This oversimplified treatment cannot be expected to yield exact figures, but they are close enough to give a working idea of the speeds that must be attained.

The decision to attempt the experiment at this time is not arbitrary. It appears as the natural consequence of the current state of rocket engineering, coupled with the present need for improved scientific data concerning the upper atmosphere.

Up to a height of about twenty miles, the earth's atmosphere is the object of continuous observation in nearly all parts of the world. Measurements are made by soundings with meteorological balloons, and by the various types of instruments that are commonly used by

① Astronomical Data

(in round numbers)

Radius of Earth: 4000 miles

Distance of Moon: 236000 miles

Period of Moon: 656 hours

Proposed Distance of Satellite:

250 miles from Earth's Surface or

4250 miles from Earth's Center

② Plane Geometry

Length of circle in miles = Radius in miles multiplied by 6.28

Period in hours = Length of circle in miles divided by speed in miles per hour

Speed in miles per hour = Length of circle in miles divided by period in hours

③ Kepler's Law

(assuming circular orbits)

The square of the period is proportional to the cube of the orbit's radius.

This is equivalent to saying that:

Radius of satellite orbit multiplied by square of satellite speed = Radius of Moon's orbit multiplied by square of Moon's speed.

④ Computation

(slide-rule accuracy)

Moon's orbit = 236000 x 6.28 = 1480 000 miles

Moon's speed = 1 480 000 : 656 = 2260 miles per hour

Square of satellite speed = $\frac{236000 \times 2260 \times 2260}{4250}$

Satellite speed = 17000 miles per hour

Satellite orbit = 4250 x 6.28 = 26700 miles

Satellite period = 26700 : 17000 = 1.5 hrs = 90 min.

weather stations everywhere. The phenomena of this lower region of the atmosphere are comparatively well-known to physicists and meteorologists.

Weather balloons do not penetrate beyond that height, however, and observations become much more difficult to obtain. One must resort to an entirely different type of techniques. Until the end of World War II, all methods of observing the upper atmosphere were of an indirect nature. Studies of meteor speeds yielded some information concerning the density of the air at heights up to 75 miles or so, but little was known about temperatures or other phenomena.

Since 1946, experiments have been carried out systematically by means of the various types of rockets developed within the last ten years—V2's, Aerobees, Vikings and Deacons. The most common measurements have been made by sensitive pressure gauges carried by the rockets. The gauges are read mechanically, and the results are telemetered to the ground several times a second. Simultaneously, the rockets are tracked from the ground, and the characteristics of their motion yield valuable information concerning the density of the atmosphere that surrounds them. By combining the data on pressure and density, one can then derive the temperatures at the different heights where the rockets have traveled.

On occasion, they have carried photographic equipment as well. In particular, the spectrum of the sun has been photographed from a V2, and, in this manner, it has been possible to extend the solar spectrum into a region of the ultra-violet that is not observable from the earth's surface.

The wealth of data accumulated in these experiments of the last decade has rendered completely obsolete all previous knowledge of the upper atmosphere. One factor, unfortunately, reduces the usefulness of the rockets in this particular instance. Their flight is extremely short, thereby curtailing the amount of time that can be spent on any single experiment. In view of this, it is indeed logical that the next step in the scientists' mind be to devise a more permanent type of space "laboratory" in the guise of an artificial satellite that could be observed continuously for an appreciably longer period of time.

According to official figures quoted in the press, the greatest height reached so far by a single rocket is 158 miles, whereas the record for a two-step rocket stands at 250 miles. On this basis, one would assume that the launching of a satellite to an altitude of 200 to 300 miles could be accomplished in two steps, perhaps three.

The speed that must be imparted to the satellite in the final launching step appears, at this time, to be one of the major difficulties that must be overcome. As far as has been disclosed, rocket speeds have yet to exceed 5200 miles per hour. This is still a long way from the 18,000 miles per hour that will be required to set the satellite circling. If, through mechanical failure, the satellite is sent off with a speed (*continued on page 443*)

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

ON THE HORIZON

One of the most distressing experiences the writer of this page has is in connection with the failure of school folk to know what is on the horizon for them. Every year we know of opportunities for students to improve their training, of students and teachers to get financial subsidy to help them in their Nature work during their training period, or while they are in service, and of jobs suited for those with appropriate training.

It is disappointing to have to answer inquiries in this field by saying that the opportunity to help had passed just before the inquiry was made. This is almost as disturbing as going to some effort to place a person in an excellent position, have an acceptance filed, and then have the applicant change his mind. Such an experience, of course, handicaps our ability to serve others in the future.

This page is written to call attention to some interesting aspects of the professional horizons for workers in the field of Nature study and conservation, as well as in the teaching of biology.

When one of the writer's age reads the announcements of grants given and available from such sources as the National Science Foundation, the Fulbright fellowship program, the Ford Foundation, and similar groups, he wishes that he were many years younger, although he has been helped well by at least two of these sources in recent years. It would seem obvious that any well-trained student needing subsidy for study at home and abroad has superior opportunities to find that help. If you have such ambitions do not delay making the necessary applications. These fall months mark the deadline for the year for many of these; some will already have passed for the year when this appears in print.

Many national organizations are seeking cooperation of suitable persons to advance projects. The National Research Council, through its committee on biological policies, is advancing a number of studies designed to help teachers in the biological and physical sciences. Cooperating with the National Association of Biology Teachers, the National Science Teachers Association, and similar organizations, they may be able to present some sound conclusions based on "grass-root" reactions such as some of you may be able to give.

A.A.A.S. meets in Atlanta

Reports on many of these studies, both of the progress and final type, will be available through various national meetings. You may wish to attend some of these, such as the meeting of the American Association for the Advancement of Science in Atlanta during the Christmas holidays. The results of one of these long studies executed by the National Association of Biology Teachers, and underwritten by the American Nature Association, should be available in book form before this appears in print. It is a report of conservation practices found appropriate by classroom teachers across the country.

Each year, in recent years, the National Wildlife Federation has underwritten teacher workshops, scholarships and fellowships. In some States the workshops are summer affairs, but in others they are held through the school year. Teacher groups may wish to stimulate such workshops in their State to the end that they may make suitable use of this support. The workshops are administered through the state affiliates of the Federation. Their addresses may be had from the National Federation in Washington, D. C. The fellowships and scholarships are available to individuals who can demonstrate proved ability to do superior work, usually in the field of conservation or conservation education. Applications for these grants, which run to $1500 a year must be in their final form by January 1, but might well be cleared before that.

Wildlife Federation grants

In this past year these Federation grants have been made available to help various studies. These include a study of mountain sheep; preparation of a book for teachers of conservation; preparation of material suitable for television work (this is now a regular feature of a New England station); survey of a series of teacher workshops to determine the effectiveness of different methods followed. This is to be published this fall. Two scholarships of $500 each were given to undergraduates working to prepare themselves for service in the conservation field. Applications from those interested in public relations and journalism have been sought in the past, but for the most part competition in these areas has not been keen. Applications for these fellowships and scholarships should be made to the National Wildlife Federation, 232 Carroll St., Washington, 12, D. C., reasonably soon to be sure that everything is in order when the deadline is reached. These grants are made to individuals, but must be backed by institutions and persons qualified to assure that the work done is of suitable caliber.

In addition to these opportunities for professional improvement there are, of course, many institutions that have fixed grants designed to help worthy teachers and persons. If you are interested in getting this help, do not get the idea that next summer and the next school year are at this time a long way ahead. They are not. By the time you learn the nature of the grants available, whether they are within your field of interest, if your candidacy would be considered suitable by the institution where you wish to work, under the leadership you would prefer and by the agency sponsoring the grant, the deadline may very well be on you. Frequently these projects call for supporting recommendations from busy persons who may not supply the needed information promptly. You should take this into consideration. You should also be sure that those who recommend you know you well enough to remember you. Last year I was asked to recommend a student who was a member of a class of fifty students more than a decade ago.

In that time she had changed her name and she did not give me her maiden name. Straightening this matter out was naturally time-consuming, and it would seem that the responsibility should lie largely with the applicant. Just remember if you have a good record, and are willing to make some sacrifice, there are plenty of opportunities for you to get help in improving your professional standing in Nature and conservation work. The horizon is bright for those who wake up early enough to see the sunrise.

Bartsch

(*continued from page 432*)

bridization was taking place. Through breeding experiments he produced new forms—an early application of artificial hybridization.

The naturalist's searching spirit took him on many scientific expeditions. He roamed the oceans and seas, from the Atlantic to the Pacific, collecting marine materials, bird and plant specimens for the Smithsonian Institution. On his trip to the Philippines aboard the *Albatross*, in 1907-09, he used the submarine light, which he devised for nighttime observations of undersea life. Working from a gangplank, he lowered the beam into the water. He transmitted what he saw into vivid, carefully narrated descriptions, so typical of his written works.

". . .A swish or two of the light and a raising or lowering of it at once attracted a cloud of minute forms; then larger elements came, in part attracted by the light and in part by food. The protozoans accumulating about the globe were soon followed by worms and crustaceans, whose tangential course would soon have carried them beyond our light were it not that the fascination curves them more and more and apparently renders them unable to escape the charm that draws and bends their path to spin about the globe.

"We soon found millions of creatures drawn into a spinning vortex about our light. But new members were soon added; small fish of various kinds, a school of sardines dashing madly after the small crustaceans and worms, and still larger and larger fish at greater distances from the light, always preying upon the lesser circle within; now and then even the shadowy outline of a large shark injected itself into the distant reaches of our lamp. It was a mad dance, this whirling circling host of creatures."

The thousands of mollusks gathered on this and other trips served as laboratory materials for the naturalist's great pioneering work in classifying these forms of life. His major theories concerning the relationship of the various genera, families and species of mollusks have stood the test of time.

Dr. Bartsch, as Curator Emeritus of the National Museum, is still writing, spending most of his time within the boundaries of Lebanon. Here, he has turned out such monumental works as *The Terrestrial Mollusks of the Family Urocoptidae in the Island of Cuba; Our East American Oysters*, and is working on his current monograph dealing with the largest family of American marine mollusks, the Pyramidellidae.

"I've had a full and happy life," he said, "and I'm grateful to America. There is no country in the world that gives so much opportunity to a man who wants to use his gray matter. I'm not through yet, though," he added with a twinkle in his eye, "I look forward to a good many years. Father lived until 86 and mother until she was three months short of 100."

Everyone who meets Dr. Bartsch—students, friends, associates—love him for the inspiration and knowledge that he has imparted to them. A visitor to Lebanon cannot help but realize that he is also loved by the plants and animals that he studies and cares for in his gentle manner. He is loved by the earth itself.

Outdoor Hazards; Real and Fancied
By Mary V. Hood. New York. 1955. Macmillan. 242 pages. Illustrated by Don Perceval. $3.95.

The author gives this book the subtitle of "A Guide to Out-of-Doors Safety for Campers, Hikers, Hunters, Fishermen and Travelers in the United States." She says that the book is written for those planning a trip or for leaders of youth groups. It seeks to remove false fears of the outdoors; to alert the camper or hiker to the relatively few natural hazards to be found; to help youth leaders and parents in introducing youngsters to fun outdoors; to save the lives of innocent creatures that are harmless but often killed out of ignorance. This is a useful, practical, positive and valuable book.

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THE Nature CAMERA

By EDNA HOFFMAN EVANS

"Come, take up your hats, and away let us haste
To the Butterfly's Ball and the Grasshopper's Feast . . ."

Silly Season

FOR SOME REASON OR OTHER the lines of the jolly old poem kept running through my mind. Perhaps it was because—as I read in the newspaper in July—summer is the "silly season." At any rate the words "hat" and "grasshopper" seemed to strike a responsive chord in my brain. Thought led to action, and the reader can judge for himself whether or not the results were silly.

Most people that I know—myself included—manage to do silly things around the calendar, regardless of the month or the season. If summer is sillier than any other portion of the year, it may be because the vacation period gives us more time to think up silly things to do. Perhaps, too, the summer's bounty provides us with more silly opportunities.

For my own part, I know that the big yellow-and-red lubber grasshoppers that appear in the garden every summer have always tempted me with their photographic possibilities. Every year I take a few pictures of them. Their gay colors show up well as transparencies, while their size makes them good black-and-white subjects, too. But always before I have posed them naturally, on a lily stalk or peeping over the edge of a leaf. Never had I thought of costuming them.

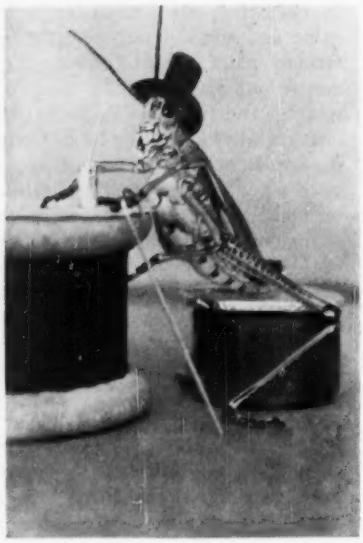
But this past summer, as I said before, the lines from "The Butterfly's Ball" kept running through my head. Finally I decided to see what I could do with a dressed-up grasshopper.

Ordinarily, I do not approve of dressed-up animal subjects. The sight of a chimpanzee in rompers revolts me; nor do I find the rare organ grinder's monkey appealing. Puppies and kittens decked out in doll clothes are pathetic looking little creatures—sad enough in real life and doubly so as pictures. So why should I want to costume a grasshopper? Search me, but in mid-summer it seemed like a good idea.

A Grasshopper "Star"

First, of course, I had to find a grasshopper, but that was a relatively simple matter. After a half-hour spent skulking through the shrubbery I had three good sized ones—two for stand-ins in case something happened to my "star."

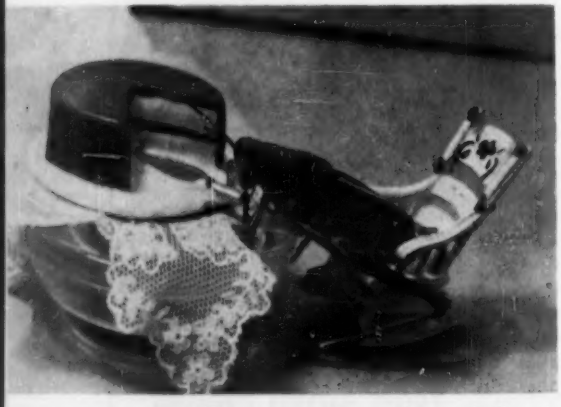
Raw materials for my costumes were simple enough—a roll of brown masking tape, another roll of black plastic electrician's tape (from each of which I used only a scant inch or two), some bits of paper clipped from an old envelope, a couple of inches of thin copper wire, a small piece of aluminum foil, and a bottle of india ink.



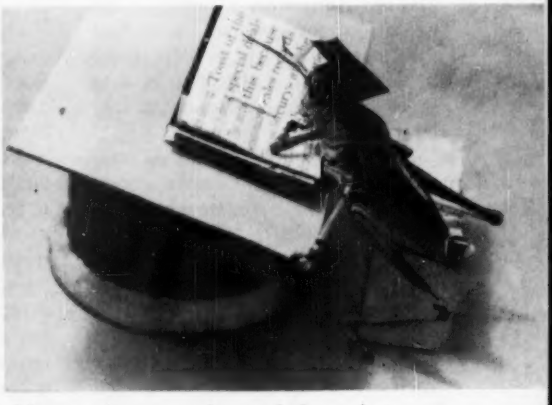
A top hatted character from cafe society.

The black tape formed the crown of the stovepipe hat I concocted, while the brim was black-inked paper. The brown tape and paper (plus patience) I used for the other hats. The wire became a cane, and the aluminum foil a tumbler. Other props came from Dad's tool box or from Mother's extensive collection of salt and pepper shakers.

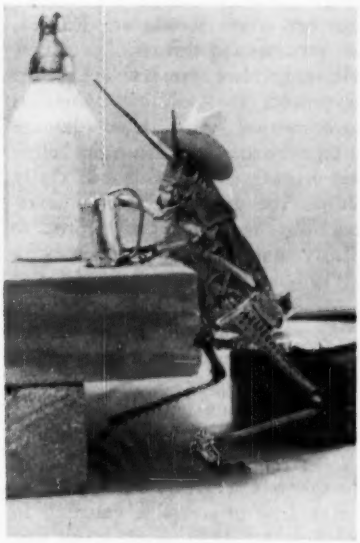
For the final shooting I built a stage, outdoors under the car port, where there was a switch and socket handy for the attachment of a single photoflood and reflector. The light shot down diagonally from above and was reflected back on the model by a sheet of aluminum foil that



This picture gives a cluttered effect for there are too many properties.



Here we have a studious scholar, collegiate mortarboad and all.



Change hat and props and it's a lad from the wide open spaces.

comprised the right wall of my stage. (I wonder how many other silly summer photographers find their materials in the kitchen, garage, and garden.)

My grasshopper model, I must admit, had to be anesthetized—as quickly and (I hope) as painlessly as possible with insecticide. Ordinarily, under no circumstances, would I harm a subject for the sake of a picture but, somehow, insects do not incite in me the feeling of fellowship that most other living creatures arouse. Besides, war was declared on lubbers in the garden long ago.

As I figured out my first grasshopper pose, more lines from "The Butterfly's Ball" flitted through my brain:

"Then the Grasshopper came
with a jerk and a spring,
Very long was his Leg, though
but short was his Wing;
He took but three leaps, and
was soon out of sight,
Then chirp'd his own praises
the rest of the night."

My grasshopper was going to stay put longer than the one in the poem, although the leg and wing description fitted him very well. Just for the record, though, lubbers do not chirp. Instead, they make a dry, rustling noise, similar to the sound that results when you rub the palms of your hands together briskly. Nor do they make a noise at night, being definitely daytime creatures. Poets, apparently, do not have to be as accurate with their facts as Nature writers and photographers.

In imagination, I posed my first grasshopper in a swanky setting, dim lit and with soft music in the background. In front of him, as he leaned casually against the table (a toadstool would have been ideal but lacking that I used a large spool) there was a long, tall glass of something cool to drink. His hat was held in place by a drop of glue, his cane leaned jauntily against an arm, and he looked quite at home in cafe society.

Change of Character

A change of hats transformed him into a character from the wide open spaces. The properties had to change too, so I used some bits of board for the table, substituted a mug for the glass, and added the demijohn. The rest of the setting remained the same, but the soft music in the background changed to the blare of a jook box and the atmosphere grew smoky and boisterous.

Then, having made two rather disreputable characters from my grasshopper, I decided to transform him into a scholar and a gentleman—a scholar, anyway. This was done by taking off his western hat and substituting a collegiate mortarboard. The table, given a slanting top, became a desk, and the drinking vessels were replaced by a book over which my grasshopper leaned in a studious manner. In case the reader wonders at the text, I must admit that the printing was clipped from an advertising folder. I did not expect it to show quite so clearly in the final picture.

The fourth pose is not so successful; at least it does not please me for it makes me think of cockroaches in the cupboard. I trusted to properties and omitted the hat, which in this case should be a sunbonnet or an old lady's dust cap. The rocker is from the aforementioned salt and pepper collection, and so is the piece of cake. The lace table cloth is the corner of a handkerchief. All in all, the picture looks cluttered. Simplicity, I think, is the keynote to pictures like this. Just the suggestion of a setting is much more effective than elaborate properties.

As for the technical part of the project, I used plus X film in the Exakta. The shortest extension tube brought the camera within about eight inches of the grasshopper model and the scene filled the groundglass. My shutter speed was

(*continued on page 443*)

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The Weather

(*Continued from page 404*)

little judgment based on personal experience, and come up with a forecast of how the weather maps will look several hours hence, or the next day.

All of this may explain why, despite painstaking efforts, the Weather Bureau occasionally "bloops" in a big way. Statistics show, however, that the forecasts are right far more often than they are wrong. A check over a period of twelve months gives the Bureau a score of about 85 percent right, which is a fair batting average in any league.

In recent months interest of the general public in weather has gone considerably beyond the matter of forecasts. Judging by the "fan mail" reaching the U.S. Weather Bureau, two phases are causing concern: (1) "Is the climate of the United States changing?" and (2) "Have the atom bomb tests affected our weather?"

To question (1) there are two answers: "Yes" and "No." That is, winters are no longer as severe and summers as warm as in former years within living memory. This is a change in the *weather*, yes, but not necessarily in the *climate*, which is determined over long intervals and is an average of the weather of many seasons. There is every reason to believe that the meteorological pendulum will swing back, as it has many times before. To the weatherman the weather is never *unusual*, just different from day to day and place to place. The only constant thing to him is change.

Or, as Dr. Francis W. Reichelderfer, chief of the U.S. Weather Bureau puts it, "Normal weather is mostly a mathematical fiction. Vagaries are normal."

As for the A-bomb blasts and changes in the weather, a special study made by L. Machta and D. L. Harris, Weather Bureau experts, confirms what other scientists have already surmised—"no connection." There is even a theoretical possibility that huge nuclear explosions may take some of the charge out of regular thunderclouds.

In the spring of 1954, when tornadoes were numerous, and more destructive than at any time in recent years, the same question poured in. The same answer applies. The Bureau doubts, too, whether we have had many more tornadoes recently, explaining that higher figures mean better reporting from more weather stations. Tornadoes, as a rule, are local storms. Formerly they escaped notice unless there was a considerable loss of life.

The three "Yankee hurricanes" of 1954 have been a little more difficult to explain, but the Bureau contends that none of them was caused by or related to recent nuclear experiments. A change in the pattern of high polar airstreams in the eastern part of the United States since 1938 (long before the first A-bomb was set off) is responsible, Jerome Namias, chief of the Weather Bureau's extended forecast section, told the American Meteorological Society in January.

Another explanation is that hurricanes may run in cycles, and show an affinity for certain areas for a period of a decade or more. For instance, the Gulf States were hit hard during the early part of the century, then came Florida's turn, and now the northeastern States seem to be the target.

Actually the hurricane itself is still something of a mystery. The Bureau has set up a special hurricane forecasting center in Miami, and the warnings sent out by this office are credited with the saving of many lives in the Florida area. With evidence piling up that the entire Atlantic seaboard has taken on the status of a hurricane area, the Bureau plans to set up a greatly improved warning system and to educate the public through the press and radio as to just what a hurricane warning means.

Loss of life in Hurricane Hazel last year might have been much less if the public had taken the warnings as seriously as the people of Florida have learned to do. Yankee motorists who would not let "a little wind and rain stop me," or curiosity seekers who want to see "what it's like outside," or merchants who pooh-poohed the idea of "boarding up," all contributed to the death and damage toll.

As for artificial rain-making by cloud-seeding and other methods, the Weather Bureau is an interested observer. There seems to be a healthy doubt among meteorologists in general as to the efficacy of seeding clouds with particles of dry ice or silver iodide as a means of bringing down rain. It has been done, many admit, with local effects. But sometimes rain has spilled over into territory where it was not wanted, and protests and threats of suit have followed. New State laws are needed to protect the public as well as governmental units from damage suits and other complications before rain-making experiments can really get off the ground. The same restrictions may hamper efforts to dissolve hurricanes and tornadoes.

Although it seldom gets its full share of attention, flood warnings, another original function of the Weather Bureau, have been streamlined in recent years to the point where lives are seldom lost and property damage kept at a minimum.

In river and flood forecasting weather reports are coordinated with the reading of riverside gauges. In addition to daily river level predictions for about 700 points on the main rivers of the United States, special warnings are made public when floods threaten. Even the routine daily forecasts are used by those engaged in river navigation, water control, power production, and industries that use water power or water supplies. Its records are studied by agencies planning to construct public works, such as dams, levees, or hydro-electric plants.

The Weather Bureau, in fact, has no "dead files." No weather observation nor statistic on temperature, air pressure, humidity, and such, is too old to be useful in computing climate and long-range forecasts. The Bureau's own records have been supplemented by the reports of thousands of observations made by others. More than 9000 selected citizens, known as voluntary cooperative observers, keep daily records of the weather in their areas reporting to regional weather offices.

Meanwhile, as the Weather Bureau goes about its regular duties of forecasting weather and floods, some of the headaches of the weather business have been taken over by a new agency called the Advisory Committee on Weather Control. The purpose of this group is to have a hard, scientific look at rain-making, checking the fall of hail, breaking up hurricanes, and similar experiments, to gauge their merits, and to try to measure where such controls may come out.

"We may achieve climate," O. Henry once wrote, "but weather is thrust upon us."

The committee has been delegated by the Congress to determine whether that is necessarily so.

Satellite

(*continued from page 437*)

much below this, it will immediately fall back to earth. The same would happen if it were accidentally released too soon at an altitude considerably below the proposed 200 to 300 miles, because, in that case, a speed of 18,000 miles per hour would no longer be sufficient to set it circling.

But even if the first experiments meet with failure, the scientists' efforts will not have been wasted. The causes of failure can be analyzed and remedied. After all, the Wright brothers' first flight only lasted twelve seconds, and the first horseless carriages had a nasty way of stalling in the middle of Main Street.

The scientific information that we hope to obtain with the help of such satellites covers an extremely wide field. The atmosphere forms a blanket that prevents most of the solar and cosmic radiation from reaching the surface of the earth. These rays are quite deadly, and there could be no life if it were not for the atmosphere's protection. On the other hand, this blanketing effect makes it impossible to observe those rays directly from the ground. It is known that solar radiation creates disturbances in the upper atmosphere, in the region called ionosphere. It has also been shown that the ionosphere renders possible the transmission of radio broadcasts beyond the horizon, because it reflects the radio waves. Any disturbance in the ionosphere will produce corresponding disturbances in radio communications. The weather all over the world is also affected by some ionospheric phenomena. By placing recording instruments at a height of 250 miles, which corresponds roughly to the outer boundary of the ionosphere, we can gather direct observations of solar radiation. This will enable us to further our understanding of ionospheric processes, with the ultimate purpose of improving long-range radio communications and world-wide weather forecasts.

In the month of October, the Moon will be full on October 1 and 31, and the New Moon will occur on October 15.

Early in the month, Mercury will be too close to the sun for observation. It will enter the morning sky on October 13, and will reach its greatest western elongation on October 29. On that date it will rise in morning twilight about an hour and a half before the sun, and will be as bright as Vega.

Venus, in the evening sky, will not be easily seen. It will be close to the western horizon, setting about half an hour after the sun on October 15.

Mars, in Virgo, is slowly becoming more favorable. It will be visible in the morning sky, rising in the east at about 4:30 A.M. on October 15.

Jupiter, in Leo, will rise in the northeast at about 1:30 A.M. on October 15, and will be nearly overhead by sunrise.

Saturn, in Libra, will set in the evening sky, approximately an hour and a half after the sun.

The Orionid meteor shower will reach its maximum of about 20 per hour on October 19 to 20. It will be observable after midnight and there will be almost no interference from moonlight.

Camera

(*continued from page 441*)

1/25, and my lens stop depended on whether or not I used the floodlight. With the light on, I stopped down to about f/11; with daylight alone the lens stop was f/4.5.

Perhaps, during another silly summer season, I will try some other characters from "The Butterfly's Ball". There are some colorful ones to be sure:

"And there was the Gnat and
the Dragonfly too,
With all their Relations, green,
orange and blue.
And there came the Moth,
with his plumage of down,
And the Hornet in jacket of
yellow and brown."

Gypsy Tour

Joseph C. Wampler, archaeologist-mountaineer, whose high Sierra trips and Havasu Canyon trail trips have been steadily growing in popularity, announces "A Gypsy Tour" to Sonora, Mexico. The season for these trips is between December 5, 1955, and January 15, 1956. Full details about these trips and other Wampler expeditions may be obtained from Joseph C. Wampler, Box 45, Berkeley 1, California.

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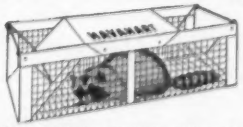

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Victoria Falls

(*continued from page 410*)

the first time after having lived near Victoria all his life, remarked of the former: "You can see it better!" But even so the "bits and pieces" of Victoria are incredibly beautiful.

The future...? Aside from the inevitable physical changes, over which geologists will continue to differ, both falls should long remain two of Nature's "spectaculars." Faced with the ever-increasing demand for power, the Waterways Commissions of Canada and the United States must keep a firm and unrelenting watch over their tempting charge. More than once, great natural beauty has gone down under the steamroller of "progress." Currently there is political wrangling over a $400,000,000 power project at Niagara Falls, "a facility capable of developing 1,240,000 kilowatts of power and of producing at least 8,000,000,000 kilowatt-hours a year and thus comparing with the country's largest hydro-electric projects." Victoria Falls are much less vulnerable. The present demand for power extends only to the town of Livingstone, whose needs are more than covered by the pint-sized generating plant so happily hidden from the visitor's eye. No such industrial development as has overtaken the Niagara area is envisioned, certainly not in the forseeable future. But Africa is marching rapidly into the twentieth century—from ox wagon straight into the air age. It behooves the guardians of the Falls not to relax their vigilance. To be sure, atoms-for-power may revolutionize the entire concept of putting water to work; in that case perhaps both Victoria and Niagara may revert for all time to their original task of supplying the world with magnificence and beauty.

Mole

(*continued from page 413*)

election bet who pushes a golf ball around the course with his nose. The mole is of powerful build in shoulders and spade-like hands, and almost certainly braces himself with one hand and thrusts with the other.

"Mole hills" in England, where the term originates, are fashioned by the genus *Talpa*, much the same as they are in our Pacific Northwest by the genus *Scapanus*, by upthrusts of material from beneath through the center of the heap, volcano fashion. The commoner genus in the eastern U. S., *Scalopus*, is more given to up-ridging the soil than to building hills. Alleged engineering uniformity of mole workings is quite overdone in English descriptions and diagrams, due, probably, to too much copying and recopying from earlier individual patterns. We can not agree with their idea that the mole hills are fortresses. Hills are usually mere excavated-earth depositories. Sometimes, however, an English mole hill is compacted and strengthened inside, like a muskrat's lodge above low, wet ground.

As a harbinger of things to be, the mole sometimes figures in prophecy, as instance the following by Scotch soothsayers: "When the moudiewarp has overrun Argyllshire to the Mull of Kintyre, it will drive all the Campbells from their estates." We wonder to what extent the prophecy has been fulfilled. Anyhow, Campbell clans, look to your mole traps!

At times, depending upon the whims of fashion and the visible supply of mole pelts available, in Britain particularly, garments and fur pieces of *taupe* are in wistful demand by milady for personal adornment. The fur is undulating and lustrous but not too durable. In the furrier's processing the pelts have been skived so thin, to get the ripple probably, that they are sort of sheer, in parlance of the trade. They also have been dyed to get uniformity in color. However, the flexible, loose skin of a mole is unusually tough for a small mammal and is well adapted to stand handling and home processing.

There is a strange color aberration in moles, appearing in the animal's coat of fur as a suffusion of yellowish-white, or in irregular patches of orange. Such markings are more commonly under the chin, and may extend backward as a partial ventral stripe. Again, irregular color patches may cover the entire ventral coat of the mole and parts of its lateral fur. We have found this same color aberration in moles of our Pacific Coast, in moles of Kansas, and in moles of the District of Columbia. Barret-Hamilton reports it so common in the English mole that in some localities it may be called a color phase, rather than an aberration.

We are curious to know the meaning of this strange variation. A mole, in darkness and blind to color blandishments, has no use for such bright colors. And there is, in Africa, a genus of mole-like mammal, with habits and habitat similar to the British *Talpa*, that is classed in the family *Chrysochloridae* and is known as the "Golden Mole."

Ontario

(*continued from page 429*)

and reforestation becomes vivid. A barren forest, deprived of humus, undergrowth, and seedlings by overgrazing, no longer fulfills its natural purpose as a water storage area, wildlife sanctuary, or profitable woodlot. One appreciates the meaning, then, of the fact that 407,243 acres of the total 3,245,440 now under Authority supervision were recommended for reforestation.

Finally, the headwaters and the fields of origin of the stream are reached and the picture is complete. A heritage has been made apparent to the visitor. Historical sites along the way in some of the valleys lend even more reality to the matter of ownership, and responsibility for natural resources. These places emphasize each generation's connection with that preceding in respect to common sharing of Nature's provisions.

Multiply one person's experience many thousands of times and the value of such a Conservation Trail is obvious. Since its opening four years ago more than 100 bus-loads of students a year have made the outing along it, most of them coming from the 7th and 8th grades. In this age bracket such a tour fits in most readily with the school program and the personal development of the student. In addition, of course, uncounted thousands of other persons have followed the prominent signs and guideposts, as well as instructions and reports placed in the local newspapers.

The best results of the work of these Authorities may not be apparent for several decades, since they are only now realizing their full potential. However, an impressive start has been made, one which will not be abandoned, and the people of Ontario take justifiable pride in their initiative and participation in this accomplishment.

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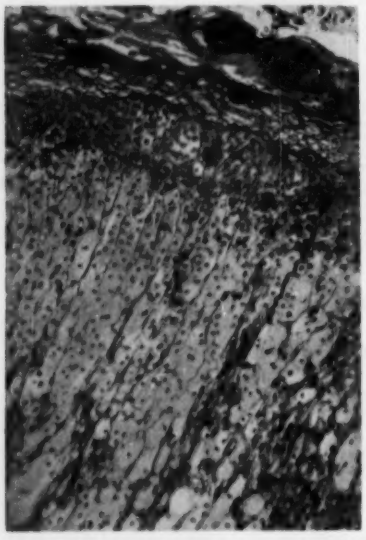
Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Gland of Stress

RIGHT on the front line of present-day research in physiology and medicine is a small structure, located on or near each kidney in man and his fellow mammals. This is the ***adrenal gland***, an average one of which measures 5 by 3 by 0.5 cm. and weighs 6 grams, certainly no great shakes in bulk, yet an object whose importance is out of all proportion to these meager dimensions. The kidney is retroperitoneal—that is to say it lies behind the membrane that lines the body cavity, and this peritoneum must be slit open and the inevitable fat removed and then the adrenal may be seen as a little cap on the anterior end of the kidney. Because this position in man is superior, the organ is also known as the *suprarenal gland* or *body* or *capsule*, a name inappropriate in a quadruped like the cat.

When cut open, the adrenal exhibits zones distinctly different in color. The outer part is a bright yellow, due to a vast number of fine lipoid (fat-like) droplets in the cytoplasm of the cells; the next layer is reddish-brown because of blood and pigment, and the innermost is gray. The first two of these portions comprise the cortex (bark) and the last the medulla (pith).



Portion of adrenal cortex, 255X; capsule with blood vessels, glomerulosa, fasciculata.

Surrounding the gland is a thick *capsule* of fibrous connective tissue, with its arteries, veins, lymphatics, and nerves. Attachment of the chief of these occurs at the *hilus* or eye, in the way a bean is fastened to its pod or like the entrance to the kidney itself. Partitions or *trabeculae* of reticular tissue extend into the gland, carrying the blood vessels. Nonidez and Windle state that more blood flows through the adrenal than through any comparable mass of tissue in the body, and we may thus be prepared to believe that there is an important relationship of blood to the gland. The adrenal is a ductless gland or endocrine organ and, like all of its kind, pours its secretions directly into the blood rather than through a duct.

The Cortex

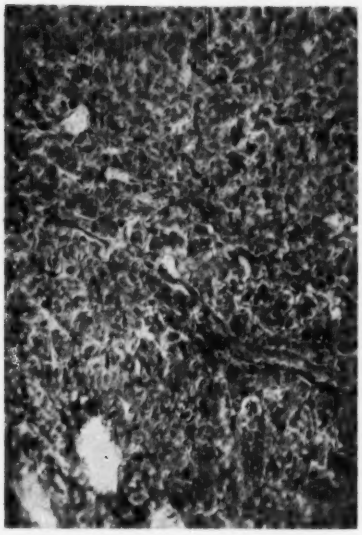
Support for cells of the *cortex* comes from reticular tissue fibers continuous with those of the capsule. These cortical cells are described as *epithelioid*, meaning "like an epithelium," since they have no free surface, unlike a true epithelium. They comprise solid cords, one or two cells thick, arranged so that they form balls and rounded loops in the outermost *zona glomerulosa*, parallel strands in the *zona fasciculata*, thickest of the three portions, and branching and anastomosing cords in the inner *zona reticularis*. These three terms describe the appearances: *glomus* is a ball, *fasciculus* a little bundle of parallel rods, *reticulum* a little net.

In functioning, the zona glomerulosa seems to be a relatively inactive area of secretion, but one where a great deal of cell division occurs. The cells are darker, nuclei quite dark, and lipid droplets few. In the fasciculata, abundance of these droplets imparts the yellow color to fresh material and the light color (seen in one of the accompanying illustrations) to fixed and stained sections; alcohol dissolves out the lipids, leaving empty vacuoles. In the reticularis are both light and dark cells, brown pigment (lipochromes) increasing the darkness of the latter. Some think these dark cells are degenerating; others surmise that both the light and dark cells are dying, to be replaced by a gradual shift of cells downward from the glomerulosa.

(PHOTOMICROGRAPHS FROM SLIDES LOANED BY WARD'S NAT. SCI. ESTAB., INC.)

Adrenal gland, 15X, with capsule. Zona fasciculata is light-colored.

The significance of these observations with respect to the work of the cortex is not apparent. In the early days of endocrinology all the emphasis was on the medulla, whose secretion has been known for many years; older works would state that the function of the cortex was unknown, or thought of the whole gland as the producer of a single secretory product. In 1855 the London physician, Thomas Addison, described the disease that bears his name, and the symptoms that lead inevitably to death, including a peculiar bronzing of the skin, extreme weakness and emaciation, low blood pressure, and a progressive anemia. One hundred years ago this affliction was termed "a disease of the suprarenal body." In the 1920's there were references to the use of an extract of the adrenals of sheep and oxen in medicine as an astringent, a stimulant, and to arrest hemorrhage. In the 1930's the term *cortin* appears as a name for a hormone from the adrenal cortex, and it "prolonged the life of animals with impaired adrenals." Today, according to Maximow and Bloom,



Adrenal medulla, 255X. A bit of the reticularis shows at top.

twenty-eight different substances classed as *steroids*—complex organic chemicals related to fats—have been distinguished in the adrenal cortex. Six of these have marked *corticoid* activity and several others have sex-hormone activity. No one of them alone, it is emphasized, can produce all of the effects of a crude extract of the cortex, and so no one of them can be called *the* cortical hormone, as if there was but one.

The corticoid activities have to do with a number of regulations in the body that can be handled in no other way; no other gland can take over when the adrenals are destroyed, and as these functions are essential to life, the only thing that can be done is to supply extracts of these glands from animals (substitutional therapy). Perhaps most fundamental, the cortex regulates the *water balance* of the body; lack of sufficient hormone results in dehydration of the body tissues in general and finally of the blood. Also of paramount importance, the *salt balance* is regulated. One hormone now definitely known, and which has even been synthesized, is *desoxycorticosterone*, which governs the proper levels of sodium and potassium in the body. For example, after removal of the cortex in experimental animals there is excessive excretion of sodium chloride and water in the urine, and these losses must be made good by adding salt to the drinking water in trying to keep these animals alive.

The second general corticoid activity has to do with carbohydrate metabolism. Adrenalectomy produces a marked fall in the glycogen level in liver and muscle and of glucose in the blood. This has been taken advantage of in diabetic animals; removal of their adrenals restores the carbohydrates to a level more nearly normal, but at the same time reveals upsets in both protein and fat metabolism. The cortical steroids that regulate these basic matters have been collectively designated the *glucocorticoids*.

Still other tasks deal with maintenance of the connective tissues of the body in a proper state and this seems to be one of the chief effects of the recently much-publicized *cortisone*, notably in rheumatoid arthritis and rheumatic fever. Animals are prepared to meet situations involving *stress* by a stepping-up of cortex productions. Ability to meet such conditions as changes in blood pressure, temperature, blood-sugar level and the like depend on these steroids.

Another group of cortical offspring are termed the *androgenic corticoids*, since they resemble the sex hormones and play a role in the maintenance of normal sexual development and activity. There is evidence that these come from the zona reticularis and that a certain type of tumor that upsets relationships in this area (androgenic tumors) result in masculinization in women, particularly evidenced by the growth of a beard.

The zona glomerulosa is that part wholly or chiefly involved in the production of desoxycorticosterone, whereas most of the other fractions seem to come wholly or mainly from the zona fasciculata. This is true also for another function,—the storage and release to the body of ascorbic acid or vitamin C. Still other steroids from this zone influence lymphocyte and antibody production.

Much research has been done on the way that the master gland of the body, the pituitary, regulates other glands and various bodily functions Among its hormones there was one designated, until recently, the adrenotrophic, and said to "regulate the work of the adrenal." This is now called the *adrenocorticotrophic hormone*, or ACTH, a modern wonder drug that has aroused a great deal of popular interest. Its function is to stimulate the adrenal cortex to manufacture its various secretions, since removal of the pituitary leads to atrophy of the cortex. Studies on the physiology of stress indicate that the output of

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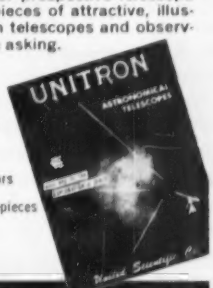

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ACTH is proportional to the intensity of the emergency. This production is in turn regulated by the adrenal, preventing an excess production by the pituitary. The gland in the head stimulates, the gland on the kidney inhibits, so that when everything is working properly there is a normal flow of both secretions.

The effect of one of these two hormones may duplicate that of the other. For example, clinical use of either cortisone or ACTH will cause a disappearnace of eosinophils from the blood. Adrenal cortical hormones also affect the thyroid, in the field where their work overlaps—carbohydrate metabolism. Thus the adrenal cortex, a smallish amount of tissue, is becoming better known with each passing year and is seen to be one of the most important of all substances in the body, and one that is essential for life. Its productions regulate a great many fundamental operations in the body and have basic relations with such other organs as the pituitary, thyroid, and sex glands.

The Medulla

Cells of the adrenal *medulla* look very different from those of the cortex. The transition may be more or less gradual, as in man, or abrupt. The principal cells are arranged as a network of strands and irregular anastomosing cords, interspersed everywhere with the spaces occupied by sinusoids,—the wide capillaries and veins here present. The nuclei are large and clear, but the cytoplasm is filled with fine granules that exhibit the *chromaffin reaction*, described by Kingsbury in 1911; when tissue is fixed with potassium bichromate these granules are stained brown, and for this reason received the name *chromaffin granules*, and even the cells came to be dubbed *chromaffin cells*. The granules are believed to be either the precursors of or the secretion itself, known as *adrenalin(e) or epinephrin(e)*. The last-given name and spelling, epinephrine, seems to be winning out in the race for preferential use.

Epinephrine has been called the great emergency hormone and, a decade or so ago, students were taught how this substance, poured into the blood at times of stress, prepared the body to meet emergencies—to fight or to run, as instinct or judgement dictated. Thus, extracted and used experimentally, this hormone causes contraction of the smooth muscle cells of the blood vessels (vasoconstriction) in a selective manner and dilates the bronchioles of the lungs. The blood pressure is stepped up, the heart pumps faster, more air is drawn into the lungs, and blood is diverted from the viscera to the skeletal muscles. The attack of asthma is halted by a shot of this wonderful preparation. But, unfortunately for the working out of this beautiful example of a hormone as a chemical messenger, it has been discovered that epinephrine is destroyed in the blood, and so rapidly that it can be detected only in the adrenal veins, and hence its action cannot be as widespread, lasting, and important as once thought. These actions imitate the effects caused by the sympathetic nervous system and are hence called *sympathomimetic*. The adrenal medulla is not necessary for life and Maximow and Bloom even go so far as to state that it is now uncertain whether it plays any important part at all. The same conditions of both the internal and external environment that bring on the secretion of epinephrine, also cause the adrenal cortex, the pituitary, and the sympathetic nervous system to go into action. Possibly epinephrine functions by triggering the nerves.

Development and Origin

In its embryology, the human adrenal recalls some interesting steps in its evolution. The cortex arises from cells of the coelomic epithelium located near the base of each side of the dorsal mesentery, and hence is a mesodermal derivative; in less precise language this means that a mass of cells buds off from the lining of the body cavity of the embryo, on either side of the middle line of the back. The medulla comes from cells of the sympathetic ganglia, therefore ectodermal, that migrate down along the cortex cell masses, penetrate them, and much later come to lie entirely in the center. This origin is significant when one recalls the similarity in action of sympathetic nerve cells and the secretion of adrenal medullary cells.

The mechanics of this peculiar dual development are such that detached pieces of the gland may occur, the *accessory adrenals*. Some of these may be carried to a considerable distance, particularly in the male mammal at the time of descent of the testis; they may or may not contain a cortex and a medulla. Detached bits of medulla alone are not called adrenals, but *paraganglia*; they contain chromaffin cells, but it is disputed whether or not they manufacture epinephrine.

The adrenal is relatively much larger before birth than after. In the postnatal period a large region of the cortex next to the medulla involutes (degenerates) and soon disappears. This is the *androgenic zone*, where the androgenic corticoids are produced, and Nonidez and Windle mention the interesting idea that its large size at first is due to a compensatory overproduction of male hormone by the fetus to offset the mother's female hormones.

In fishes the adrenal cortex and medulla are two completely separate structures. The cortex is represented by the *interrenal gland* consisting of cords of cells associated with sinusoids, whereas the medullary function is performed by numerous discrete *chromaffin bodies*. These two components lie side by side or are intermingled in amphibians, reptiles, and birds, and finally combine intimately to form an apparently single but actually double organ in mammals.

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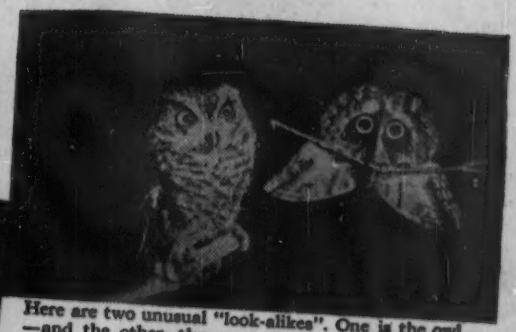

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